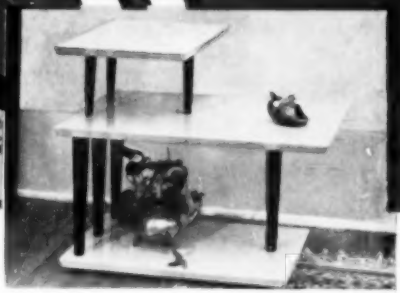
# WOOD WORKING Digest



## JANUARY 1954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**WOOD WORKING DIGEST**

222 E. Willow Ave. Wheaton, Ill.

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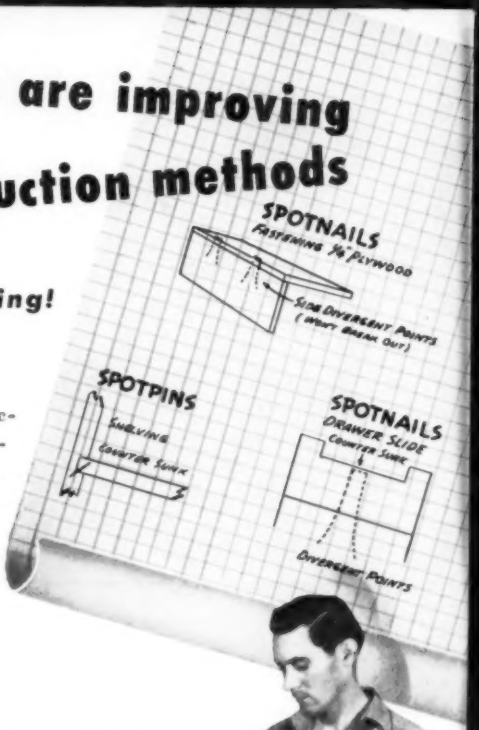
A HITCHCOCK PUBLICATION

# SPOTNAILS are improving furniture production methods

*One shot no-split nailing!*

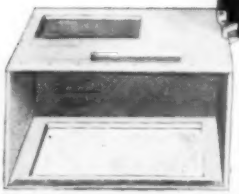



### THE SPOTNAILER

Light, portable, virtually indestructible nailing machine drives nail-like wire fasteners in sizes from 3/16" to 1⅛". Use Spotnails for fast, neat assembly of case backs, drawer bottoms and slides, panelling and dozens of other production fastening jobs.

### THE SPOTPINNER

The familiar round 12 or 15 gauge sashpin in lengths up to 1¼" are now driven with one blow of a rubber mallet. Use Spotpins for pinning glued or unglued joints. Chisel points cut through grain of wood to avoid splitting. Flush driven or counter sunk without hammer marks.



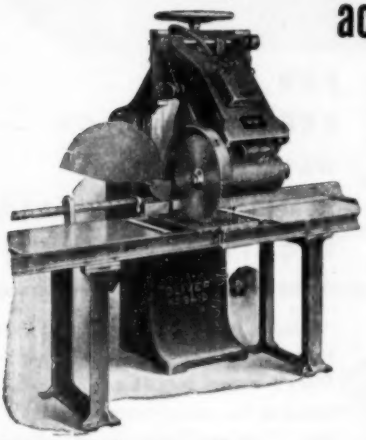
*A trial in your own plant will prove our claims of better work—lower cost.*

**SPOTNAILS, INC.**

**EVANSTON 1, ILLINOIS**

# "OLIVER" Cutoff Saws

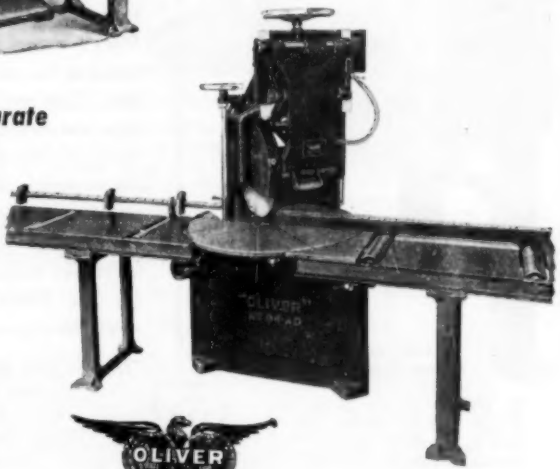
## make square or angle cuts . . . accurate to .005-inch!



For fast, easy operation "Oliver" Cutoff Saws are unmatched. The suspended-link, straightline motion assures accuracy. It returns to its original position without rebound. Has ball bearings throughout with tapered roller bearings for suspending arm. Takes saws 10" to 18" diameter. An 18-inch saw cuts stock 4½" thick. Write for full details.

### *For smooth, accurate angle cuts . . .*

The No. 94-AD (right) makes smooth, straightline and also angle cuts. Saw arbor swivels 45° to right, 15° to left. Operates by a light touch. This compact machine has a saw table with automatic cutoff gauge and ball bearing steel rollers. Write for Bulletin No. 94-AD.



OLIVER

**OLIVER MACHINERY COMPANY**

*Established 1890*

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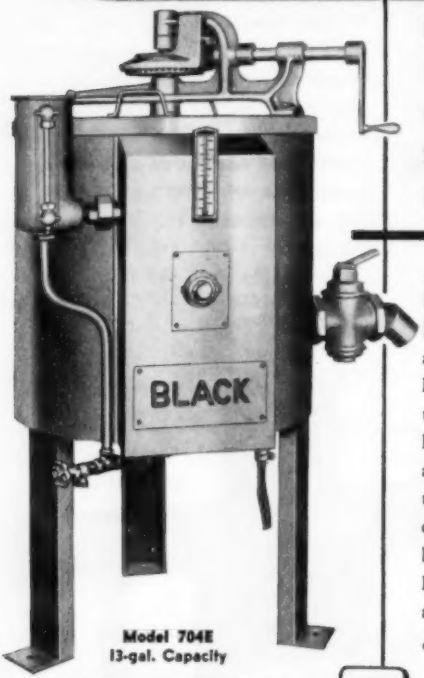
*by Black Brothers*




**Model 704E**
**13-gal. Capacity**

In addition to the Series 700, Blacks have a complete line of simple glue heaters, continuous glue preparers, portable pot glue heaters, and contact heaters.

**FOR THE PREPARATION OF GLUES AND SIMILAR MATERIALS REQUIRING HEAT**

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"We ourselves are very much pleased with our STANDARD STACKER, and so are the men who work with it."

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WOOD WORKING Digest

JANUARY, 1954
Vol. 56, No. 1

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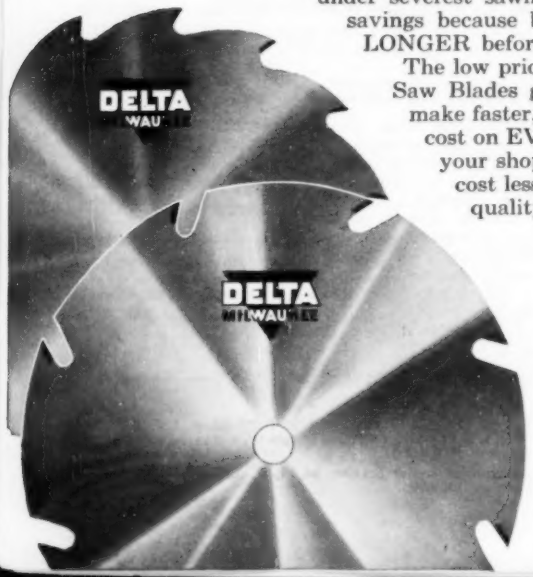
The low price of DELTA Carbide-Tipped Saw Blades gives you the opportunity to make faster, smoother cuts at much lower cost on EVERY job that comes through your shop. Your sawing operation will cost less, yet you'll produce more top quality work per day.




- Saw 25 to 100 times longer before resharpening.
- Make all cuts in all woods and wood laminates.
- Cut faster, smoother and freer.
- Saw plastics, metals, and abrasive materials.
- Safer . . . resists kick-back.
- Cut-for-cut, lowest in cost.

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**With DELTA CARBIDE TIPPED SAW BLADES**

***you get these performance advantages:***

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**CUTS joints ready for gluing**

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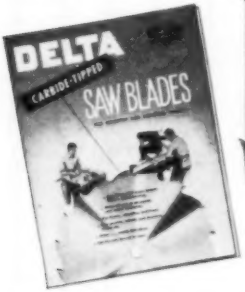

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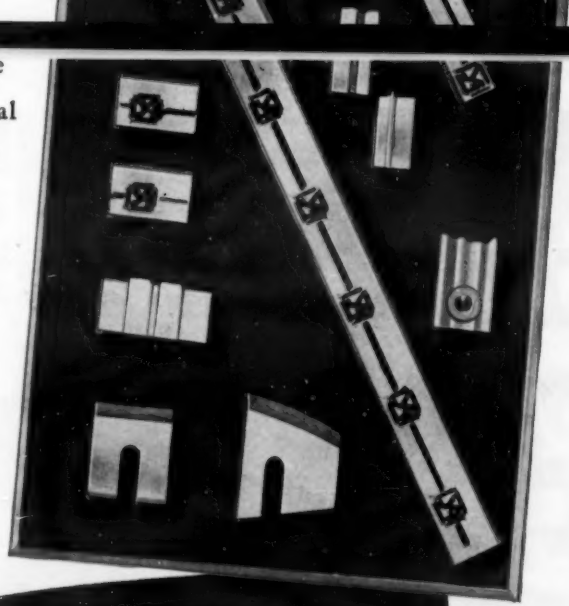

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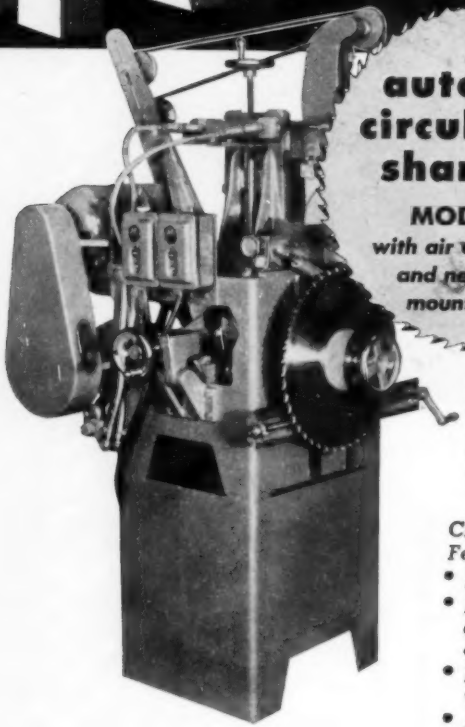

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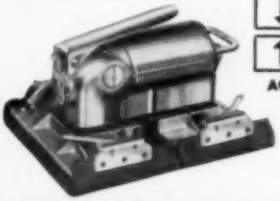

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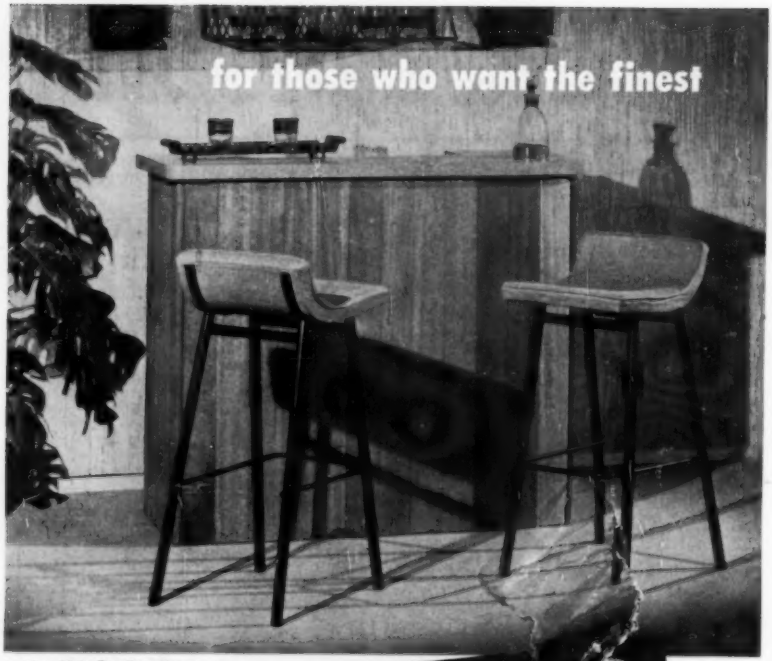


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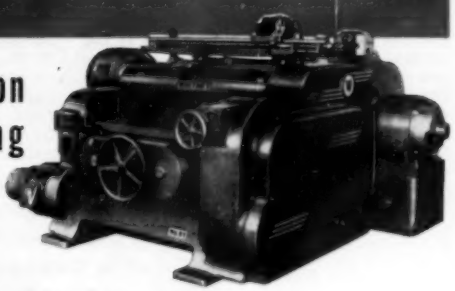
# WHITNEY 97
# DOUBLE SURFACER

## For quality production and low cost planing



**Whitney 97 Double Surfacer**
Feeds: 30 to 90 feet per minute
Planes stock ⅛" to 7" thick
Widths, 30" 36" 40" and 44"

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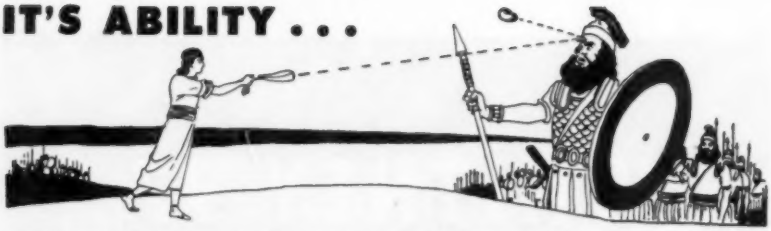

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**You, too, deserve to profit by the excellent performance of a Dependable Moulder!**

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**NEW** *Bulletin C-121*

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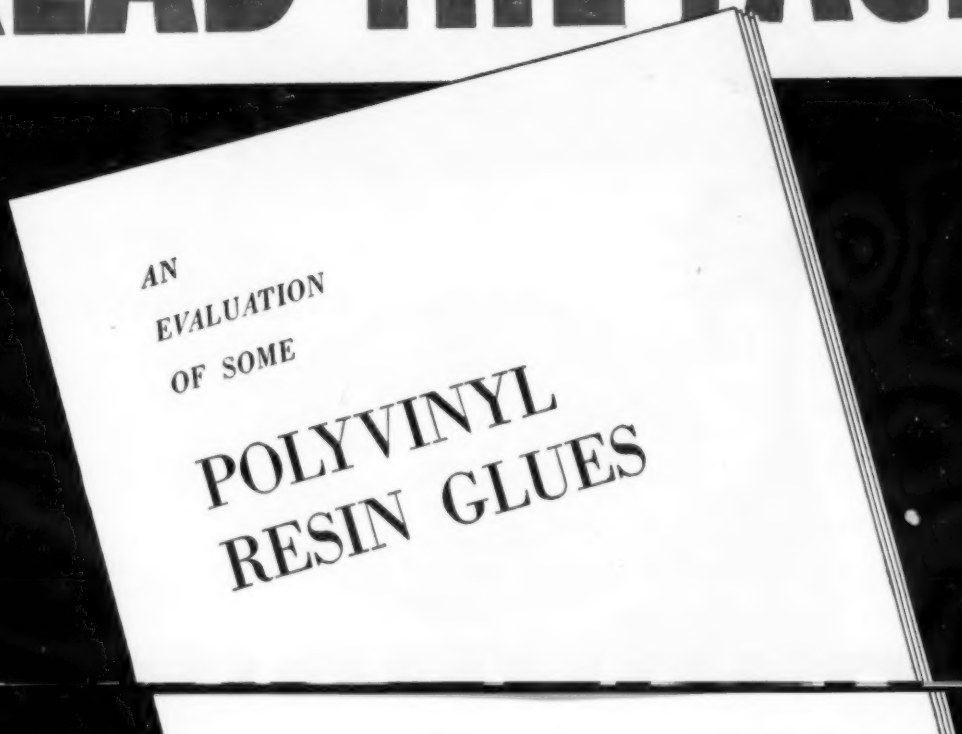

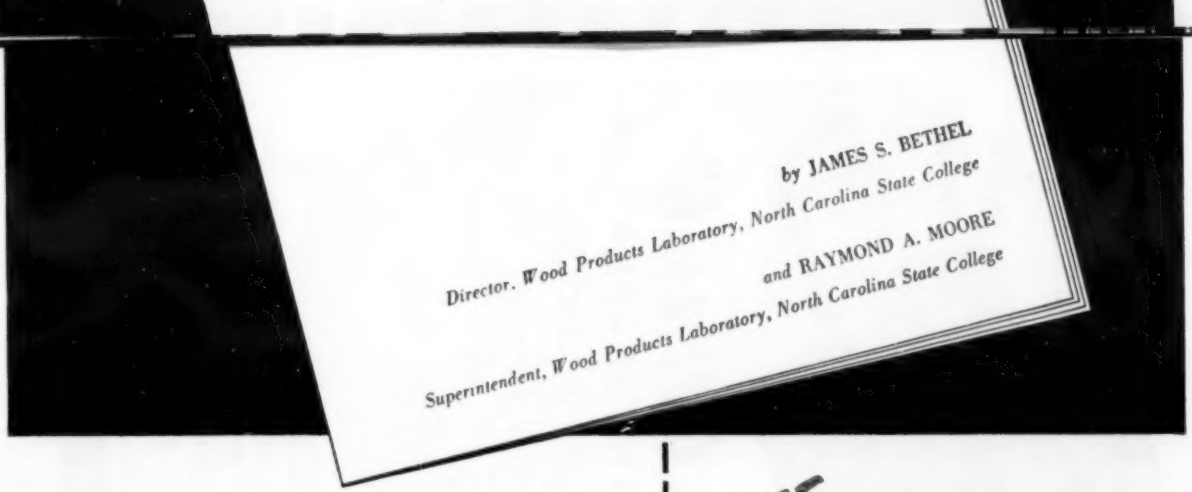
by JAMES S. BETHEL
Director, Wood Products Laboratory, North Carolina State College
and RAYMOND A. MOORE
Superintendent, Wood Products Laboratory, North Carolina State College

Eight years ago, National Adhesives introduced polyvinyl assembly glues to the furniture industry. Many similar products followed. Unfortunately, they were many times improperly used.

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The full North Carolina State College report is now ready in booklet form. Copies are available upon request.

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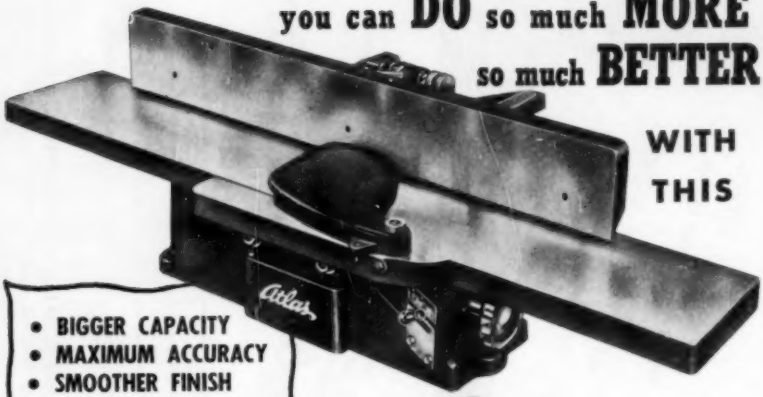


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- **MAXIMUM ACCURACY**
- **SMOOTHER FINISH**

Cutter-head-spindle is machined from a solid bar of fine-grained steel, then precision ground — 2¾" in diameter, weighs 10 lbs.

Cutter-head can be quickly removed and the blades re-sharpened while right in the cutter head.

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No other jointer-planer compares with the 6" Atlas. Unprecedented ease of operation, safety, accuracy and smoothness of cut put it in a class by itself.

The Atlas is a massive machine designed to make easy work of the toughest jobs. The solid steel cutter-head-spindle alone weighs 10 lbs. The grey-iron tables are 42" overall and the 32" x 4½" fence is actually larger than many 6" jointer tables. *Both are precision ground to .005" tolerance.*

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Before you select any new jointer-planer ask your Atlas dealer to show you all the important features that make the 6" Atlas the best buy on the market at any price.

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CUT COSTS NOW

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560 24" Single Surfacer

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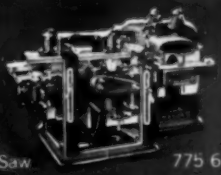

950 Band Saw

GET FAST FACTS TODAY!

**J. A. FAY & EGAN CO.**
EASTERN AND DIGEST STS.
CINCINNATI 2, OHIO

Please send me at once and without obligation bulletins checked

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## *to speed production - Just Step On It*

# PORTER 43-20J Automatic Hydracut Saw

### FOOT PEDAL CONTROL ENDS OPERATOR FATIGUE

*Increase lumber production in your plant with these Hydracut Saw set-ups.*

**1.**

*Standard Set-up. Hydracut Saw and tables.*

**2.**

*Hydracut Saw in single line conveyorized rough mill set-up.*

**3.**

*Hydracut Saws in double line conveyorized rough mill set-up.*

The Porter 43-20J Automatic Hydracut Saw saves hours of labor . . . enables any cutting room operator, regardless of age, to cut more lumber per day by eliminating tiring hand operation. Operator simply positions the lumber against the adjustable cut-off stops . . . and presses the electrically operated foot control. The saw blade, mounted on a hydraulically operated carriage, *automatically* moves forward to make the cut and *automatically* returns. Fatigue from manual "push-pull" operation is gone.

Stroke length is quickly adjusted by a convenient lever. Cutting speeds range from 0 to 45 cuts per minute.

The new Porter Bulletin 43-20J-1 fully explains the Automatic Hydracut Saw. *Send for your copy today.*

**C. O. PORTER Machinery Co.**
668 Front Ave., N.W., Grand Rapids 4, Mich.

# Black & Decker SCREW DRIVERS

*are powered for*

## faster work, greater accuracy, more dependability!

**New No. 8 SCRUGUN***
High-powered, light, compact . . . drives up to No. 8 screws to uniform tightness automatically. Quality built for high production service. Choice of paddle or toggle switch.

Choose from 21 models of Black & Decker Screw Drivers . . . for driving and tightening everything from the smallest screws to ½" diameter nuts. They're all powered by B&D-built universal motors for fast, steady driving. They're light and well-balanced—cut operator fatigue, reduce slippage and marring. Choice of positive or adjustable clutch, 90° angle heads for close quarter work. For dependable performance on all jobs, specify Black & Decker!

**See your nearby B&D distributor for demonstrations of these and other time-saving, cost-cutting tools. For free catalog, write: THE BLACK & DECKER MFG. CO., 635 Pennsylvania Ave., Towson 4, Md.**

*Trade Mark Reg. U. S. Pat. Off.

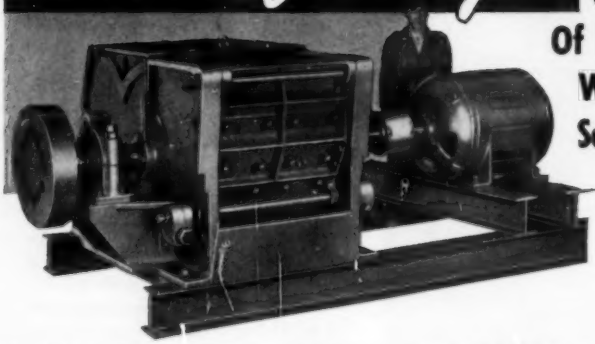
**DRILLS**
**SANDERS**
**BENCH GRINDERS**
**SAWS**
**GLUE POTS**

LEADING DISTRIBUTORS EVERYWHERE SELL

B&D Black & Decker PORTABLE ELECTRIC TOOLS

# WILLIAMS "No Nife" Hogs

**Save Up To 75% Of The Cost Of Handling Wood Scrap!**



**Handling and disposal expense of waste wood can be cut as much as 75% by reducing it to chips in a Williams Hog.** If handled manually, one man alone can move as much tonnage as three men could handle if scrap is in long strips or awkward shaped pieces. If handled automatically, top efficiency can be obtained only if wood is first reduced to chips.

**In chip form, waste wood produces the greatest heat value.** Unhogged waste cannot burn evenly because jumbled distribution of small and large pieces restricts air flow, smothers the fire, creates excessive smoke. Hogged wood chips control passage of air for even and complete combustion, yield more BTU's.

**Savings in a few months will pay for an automatic installation** for conveying wood waste to stoker or boiler.

**WILLIAMS LINE IS COMPLETE**

- Hogging, Grinding and Shredding Machines
- Vibrating Screens
- Air and Mechanical Separators
- Conveying Systems
- Cyclone Collectors
- Complete "Packaged" Plants

*Write For Complete Brochure*

**WILLIAMS PATENT CRUSHER & PULVERIZER CO.**

808 St. Louis Ave. ★ ★ St. Louis 6, Mo.

**WILLIAMS**

CRUSHERS GRINDERS SHREDDERS

OLDEST AND LARGEST MANUFACTURER OF HAMMER MILLS IN THE WORLD

## for every Saw-Sharpening need

*This makes sense:* Simonds Sawmakers *should* know how to make the finest saw files made . . . and experienced sawfilers know that they do. That's the bonus in know-how you get with every "Red Tang" File you buy. Simonds makes one quality only . . . Grade A. And that quality is double-checked by the Simonds "Prover Test." Find out for yourself how much easier it is to keep your saws sharper with Simonds "Red Tang" Files. Order from your Industrial Supplier today.

*Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que. Southern Service Shop in Meridian, Miss. (formerly J. H. Miner Saw Mfg. Co.).*
*Simonds Divisions: Simonds Steel Mill, Lockport, N. Y., Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada*

# Don't change that belt!

**It's Armour's Garalun – precision-made with tougher abrasives to last longer!**

Extra mileage is where you save money on sanding. Armour's Garalun Paper Belts give you that extra mileage because they're *precision*-made! Every tough grain is *electrocoated* firmly and uniformly into the adhesive. The adhesive is Armourclad, a powerful bond that holds the abrasive rigid – under high speeds, hard use, and heat. And the splice is even for level sanding and extra mileage. But that's just how one Armour product saves you money.

Armour Garnet discs, belts, rolls, and finishing papers last longer than ordinary abrasives because they're *heat-treated!* This scientific tempering process developed by Armour improves the lasting quality and cutting efficiency of Garnet grains. This same *heat-treating* process has extended sandpaper life, produced finer finishes, and cut sanding costs.

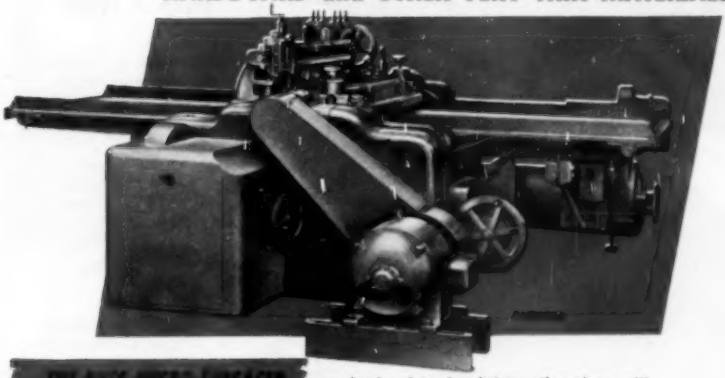
Here's how to select the economical Armour Coated Abrasive that *you* need from our complete line. Write on your letterhead to the address at right. Our salesman, who is an expert at reducing sanding costs, will call on you and help you choose the Armour abrasive that will last longer and save you money. Write us today.

**ARMOUR** *Coated Abrasives*

**Armour and Company • North Benton Road**
**Alliance, Ohio**

# BUSS Announces The MICRO-SURFACER

## A HIGH PRODUCTION MACHINE for PLANING HARDBOARD and OTHER VERY THIN MATERIALS!



THE BUSS MICRO-SURFACER was developed to do what no other planer will do satisfactorily — to plane the very thin, highly flexible materials such as certain types of hardboard, presswood and related materials, rapidly and accurately. Close tolerances are easily maintained on this machine by means of a patented work platen which rigidly holds down the stock during the feeding and cutting operation. It employs our standard planer cutterhead with high speed steel knives operating at speeds up to 5,000 RPM. (Carboloy knives are available for applications involving abrasive materials). The MICRO-SURFACER can be furnished with in-feed and out-feed conveyors for rapid handling of stock and incorporates such exclusive BUSS features as: Chrome-plated wearing surfaces, semi-automatic control of lower rolls and pressure bar, one-shot lubrication, etc. Available in various width capacities up to 50".

The services of our engineering staff are available for consultation and working out details of all planer applications. Complete cooperation will be extended in any prospective application such as profile and contour work. Drop us a line.

**BUSS MACHINE WORKS** SINCE 1862

**PLANER SPECIALISTS**

# Wapakoneta Knives

ASSURE HIGH SPEED PRODUCTION

**BIG CHIEF**

The most dependable knife for general purpose high production work.

KNIFE SPECIALISTS SINCE 1891

**MOHAWK**

Can withstand hard knots in Southern and similar soft woods.

THE **WAPAKONETA** MACHINE COMPANY

WAPAKONETA, OHIO

HOW WOULD YOU BUY A *Band Saw?*

Before you bought we're sure you'd consider all these points. The

**BOICE-CRANE 14" BAND SAW**

was designed to best fill the needs of the average shop!

FOR 40 YEARS · AMERICA'S MOST IMITATED POWER TOOLS · BOICE CRANE

## Don't You Want

**SPEED?** The Boice-Crane saws 2 to 4 times faster. Blade speed up to 4,100 f.p.m.

**VERSATILITY?** The Boice-Crane cuts, sands, grinds (some models even file), any material . . . accurately . . . smoothly.

**SAFETY?** The wheels and blade of the Boice-Crane are entirely enclosed, except at the cutting point. The blade guides can be safely adjusted by single control, even when running.

**CAPACITY?** 13½ inches from blade to the guard, permitting 27-inch diameter work. Guide to worktable: 7⅝". Blade widths: ⅛", ¼", ⅜", ½" and ¾".

**STURDINESS?** The Boice-Crane has a strong, one-piece, welded steel frame. The 15"x15½" table tilts on DOUBLE trunnions. The grease-sealed ball bearings assure long service.

**COMPACTNESS?** The over-all height of the floor model is 67 inches. The motor is in a sealed-off compartment in the cabinet base.

**12 Models—Single & 8-Speed Backgeared**
**Mail Coupon Now For Details and Prices**

**REMEMBER THIS WHEN YOU BUY A JIG SAW**

**ONLY BOICE-CRANE HEAVY DUTY 24-INCH JIG SAWS GIVE YOU ALL THESE ADVANTAGES!**

- **Cuts materials up to 5 inches thick.**
- **Wider range blade tensioner. Blades 1/16" to ½" wide and 5" to 9" long.**
- **Super-strength drive, extra capacity and versatility.**
- **1½" blade stroke—50% longer.**

Fast, accurate, clean contour and straight cutting, inserted blade work, die filing, saber sawing and sanding. Blades may be turned 90 degrees for ripping long stock. Powerful dust blower. Has the outstanding Blade Tensioner on any Jig Saw—providing fuller range for correctly tensioning tiny fret blades up to heavy-duty blades for metal; strains blades fiddle-string taut so they really cut a square face; increases blade life.

Oversize, precision ground, cast iron work table (20"x20") has two-way tilt to 45°. Splash lubricated moving parts and ball-bearing crankshaft. Over-all: 39" high, 20" wide, 38" deep.

**OPERATE THE BOICE-CRANE JIG SAW AND YOU WON'T BUY ANY OTHER!**
**Sold through industrial supply distributors in most cities.**
**Prompt delivery from dealer stock.**

**FREE!**
**BIG NEW CATALOG**
**on Boice-Crane**
**Woodworking Power Tools**
**for Cutting-Shaping-Drilling-Finishing**

**BOICE-CRANE COMPANY**
**931 Control Avenue** **Toledo 6, Ohio**

Please send free literature on Boice-Crane ( ) Band Saw; ( ) Jig Saw; ( ) Complete Catalog.

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## IN WISCONSIN, ILLINOIS, IOWA, MICHIGAN AND MINNESOTA*

# Casey's Still at Bat!

E. Morris "Casey" Jones, now in his 34th year as a Perkins Glue representative, is a fine example of why Perkins leads in Gluing Service. Basic ability plus long experience and a sincere interest in customers' problems make Jones a real asset to every glue user in the area he covers.

To merit their extensive use in Jones' territory, Perkins Glues must be the equal of any and superior to most. However, the really big difference is in Gluing Service—prompt help when the glue user needs it and continuing observance of every gluing operation to assist in attaining higher quality bonds and greater economy.

Yes, "Casey's" still at bat for you and you can be sure that he won't strike out in providing Perkins Glue users with incomparable service.

*E. M. Jones services glue users in Wisconsin, Iowa, Illinois (north of 40° latitude line), Michigan's Upper Peninsula and the Minneapolis and St. Paul areas of Minnesota.

Perkins Glue users with incomparable service!

Four areas of Minnesota.

NO MATTER WHERE YOU ARE LOCATED YOU CAN OBTAIN THE BEST IN GLUING SERVICE AND THE RIGHT GLUE FOR YOUR OPERATION. Contact the Perkins Man nearest you: E. M. JONES, 603 Plankinton Bldg., Milwaukee, Wis.; E. A. KUNE, 708 Sunset Drive, High Point, N.C.; J. L. MURPHY, Silver Hill, New Albany, Indiana; J. B. HAYWARD, 500 Sunset Drive, High Point, N.C.; F. J. BOES, 15 Grove St., West Concord, Mass.; W. H. GAY, 1024 S. Perkins Rd., Memphis, Tenn.; V. D. MARSHALL, 1133 Fuller Ave., NE, Grand Rapids, Michigan; H. J. WILLIAMS, 508 S. Cherokee Ave., Dothan, Ala.; L. E. CLARK and P. A. MACY, Perkins Glue Co., Lansdale, Pa. IN CANADA: R. C. STOCK, Perkins Glue Co. of Canada, Ltd., Kitchener, Ont.; F. ATKINSON, 441 Thomas St., La Chute, Que.

# PERKINS GLUE COMPANY

LANSDALE, PA. • HIGH POINT, N. C. • SHAWANO, WISCONSIN

KITCHENER, ONTARIO • LA CHUTE, QUEBEC

Leitelt Equipment can save many hard dollars in your plant and yard through more efficient lumber handling. For instance, the Leitelt Power Transfer Car operated by one man moves kiln car loads up to 30 tons with ease and safety. One man does a job that ordinarily takes the time and labor of five to eight men. Look around your plant or yard and see how many men are involved in handling lumber. If you are using more than one man or a Transfer Car it's time to call on Leitelt.

## SAVE Lumber Handling Dollars with LEITELT

*Write for full information on Leitelt Lumber Handling Equipment. We will be glad to advise the correct installation for your particular lumber handling requirements. Every installation pays for itself.*

Manufacturers of Lumber Lifts Car Pullers Power Driven Turntables Subcars and Leitelt Swing Tables

**LEITELT IRON WORKS**
**400 Mill St., Grand Rapids 2, Mich.**

Notice in the installation below how one man handles a kiln load of lumber. The power Transfer Car does the actual work, whether it's pushing or pulling a load into or out of dry kilns or storage tracks.

# What is your WOOD-BONDING problem?

**APPLICATION AND CURING?** "Penacolite" adhesives cure at room temperature (minimum 70°F.) in a few hours, or in just a few minutes at accelerated heat. They are easy on cellulosic fibers since curing is carried out under neutral conditions.

**STRENGTH?** For all conditions of service "Penacolite" adhesives, when fully cured, form bonds as strong as the woods they join.

**DURABILITY?** "Penacolite" bonds retain their strength through temperatures ranging from -40°C. to wood-charring heat, are unaffected by the stresses of vibration or shrinking and swelling. These bonds effectively resist oils, greases, most solvents and most acids. And they're waterproof in both salt and fresh water.

**PERMANENCE?** "Penacolite" bonds retain their strength through the years. The curing of these adhesives is an irreversible chemical reaction.

**VERSATILITY?** "Penacolite" adhesives are a good buy for *any* wood-bonding job, large or small, curved application or straight. They are also recommended for the bonding of most thermo-setting and some thermo-plastic resins and plastics, as well as natural and some synthetic rubbers.

**STORAGE?** "Penacolite" adhesives are usable for at least a year when stored at room temperature.

***Write today for our free booklet describing the "Penacolite" adhesives. We will be glad to make recommendations concerning your bonding problem.***

**KOPPERS COMPANY, INC.**

Chemical Division, Dept. WWD-14, Koppers Bldg., Pittsburgh 19, Pennsylvania

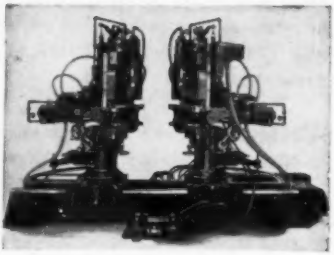
KOPPERS®

**PENACOLITE® RESORCINOL ADHESIVES**

***The original waterproof, room-temperature-setting adhesives***

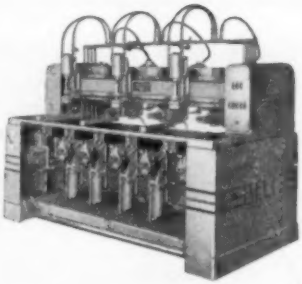
# For Fast, Precision, Low Cost BORING

## No. 24 DOUBLE-END SAWING, BORING and CHUCKING MACHINE



For manufacturers making chairs, radio cabinets, parlor frames, tables, bedroom or other furniture—this Bell 24 is a top-flight money-maker. Saws and bores or saws and chucks both ends at once, as high as 1500 per hour when fed two pieces at a time—or 750 to 1000, one piece at a time. In addition to speed, the work is done accurately — assembly goes faster, spoilage is minimized. Set-ups average about 20 minutes.

## No. 100 POST BORER



The No. 100 Front or Back Post Borer also can take costs for a nose-dive with speeds of 600 to 750 back posts per hour—each post is complete bored, *all* holes at once, in one operation. Here, too, accurate alignment of all holes pays a bonus prof.t. Set-up time averages 18 to 22 minutes.

*Write for detailed specifications.*

**Bell** WOODWORKING MACHINERY

**The BELL MACHINE COMPANY, 71 Jackson Drive Oshkosh, Wisconsin**

# *Recognizing* → SUCCESSFUL WOOD PROMOTION

In the more than fifty years that we have been publishing WOOD WORKING DIGEST we have seen many radical changes in the industry. There was a time when we didn't have to "sell" wood or wood products. People bought wood because that was the only material used to make the things they wanted.

The last few decades have seen a gradual though definite change in this situation; metal, plastics and other materials have successfully entered into competition with wood.

Deepest inroads into wood sales have come from metal. This competition has assumed major proportions, completely taking over many fields formerly strictly supplied by wood. Asbestos, plastics, rubber and other materials have also entered the race to win over more of our wood uses.

Now our industry is having to "sell" most of its products because the market is on the buyer's side. Don't get the impression from the foregoing that we are not still among the biggest industries dollarwise—in fact any-wise; but times have changed.

There are firms and associations doing a splendid job "selling" wood products in one way or another. Some through research have developed ways, means, chemicals and materials that have made wood products desirable over other materials. Others, through effective advertising and promotion have increased wood product sales. Educational exhibits and programs have broadened the knowledge of wood and wood products.

We at WOOD WORKING DIGEST feel that these firms and associations, doing an outstanding job for the industry and themselves, deserve recognition from the industry for what they are doing. The opinion of a number of our organizations and prominent individuals in the woodworking industry coincided with ours and agreed that we were the logical ones to provide this recognition in the form of an Award of Merit.

Therefore, at the meeting of the F.P.R.S. next May there will be presented, by WOOD WORKING DIGEST, a number of awards to those considered worthy by a committee representing a cross section of the industry. Beside the award placque the winners will receive national publicity.

More detailed information on page 50 of this issue.

Ned Bailey, *Editor-in-Chief*

Your firm can qualify for the contest being sponsored by WOOD WORKING DIGEST. See the story as it appears in this issue and write to us for an official entry blank.

*We are told that the '53 lumber output may set a new record even though current business is sluggish. Year-end production of 41 billion board feet is anticipated, as compared with last year's 37.8 billion feet. Imports of 2.5 million feet further boosted this year's supply. Consumption in '54 will be substantial.*

*Faced with a rising backlog of orders, leading manufacturers of prefabricated houses have scheduled production increases for 1954 which will more than double the present capacity of this rapidly expanding industry.*

*Western Union enters new field. The telegraph company is acting as sales agent for the private weather forecasting services of the National Weather Institute of Los Angeles and now offers weather forecasts from any part of the United States, large or small, for periods from one to six months. Here is an example of the way it works. A department store plans a sales drive on umbrellas and rain gear. When is the next rainy period and for how long? Agriculture groups, fuel dealers and others can make good use of this novel service.*

# LET AIR *do your TACKING WORK*

## DUO-FAST
*Direct Drive*
## AIR TACKERS

**12 Models**
Including the One
**To Speed Your Job!**

Users of these Direct Drive Air Tackers report remarkable production increases over former tacking methods. That is because these tackers are so fast, efficient, and easy to use. Women and non-skilled men workers can do a top quality job with Duo-Fast Air Tackers. Why not let air do your tacking work?

**Also Available**

A complete line of DUO-FAST Manually-operated Tackers

*Gun Tackers*

*Hammer Tackers*

**Send for the timesaving, moneysaving facts on Duo-Fast Automatic Tackers.**

**FASTENER CORPORATION** 940 FLETCHER ST. CHICAGO 14, ILL.

COMPANY.....

YOUR NAME.....

ADDRESS.....

CITY.....STATE.....

Reports and discussions scheduled for the annual meeting of the National Wooden Box Association, January 21-22, the Drake Hotel, Chicago, will feature particularly the packaging trends of 1953 in relation to plans and prospects for 1954.

*Special articles of particular interest in this month's issue include "The Carbide Story" and "Wood For Today." We'll appreciate comments from our readers on either one of these subjects.*

Serge Sacknoff, president, Washington chapter, American Institute of Decorators, predicts that homes will have fewer and larger pieces of furniture. For small houses he suggests a good hardwood floor with rugs, lightweight wooden chairs and a few good well chosen larger pieces.

*Recent census of housing reveals that the U.S. had 45,983,000 dwelling units when the last Census was taken—in 1950—a net gain of 8,658,000 in ten years. This is the greatest numerical growth in the history of the Census. In 1950, the great majority of dwelling units were in cities and suburban areas, with only a relatively small portion on farms; 64% were urban, 22% rural-nonfarm, and 14% rural-farm.*

Federal Government estimates by 1960 over 7 million dwelling units will be needed to house the growing population. It is estimated there will be 176 million people in the country, and that we'll need 55 million dwelling units by 1960.

*The International Bank of Reconstruction and Development has loaned Iceland funds to build farm structures to house 1,000 cattle and 20,000 sheep and to build 150 farm dwellings.*

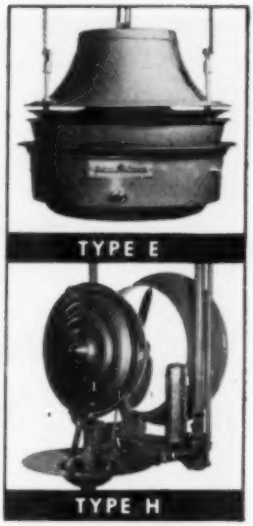
General Service Administration has gone on record that it will refuse to deal with those who collect 5% for influencing contracts, or any kind of business transaction with the Government. Administrator Edmund F. Mansure states his agency will prosecute if the actions are illegal. He made it clear, however, that the prohibition is not aimed at "legitimate salesmen or representatives who earn their living in pursuits long recognized by everybody as honest and honorable parts of the trading process."

*George N. Lamb, Secretary of the Mahogany Association, reports that 1954 may see a drop in business of from 5% to 10%. This may or may not apply to all of the mahogany markets; some of them could be even better than last year. In current decor, the neutral light browns are very much in vogue and this style preference will continue in 1954.*

Ten new Weldwood hardboard products are being introduced as part of a sharply expanded hardboard sales program by the United States Plywood Corporation.

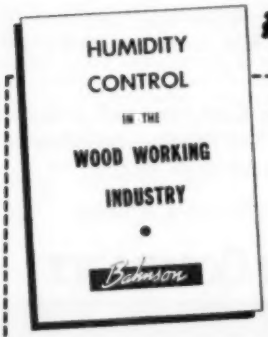
*The Plant Maintenance and Engineering Show is scheduled for January 25-28, Conrad Hilton Hotel, Chicago. Just a reminder that the National Home Builders Association Convention is also scheduled for this month in the "windy city." Early in the month the Chicago Market will open at the American Furniture Mart. See the February issue of WOOD WORKING DIGEST for the story on this.*

# Humidity Control Saves Dollars, Hours, And Headaches in Woodworking Plants!




★ **Here's positive humidity control for one room or your entire plant! The Bahnson Humidifier provides it . . . automatically, efficiently . . . for as little as $10.00 per year per unit . . . with each unit capable of handling up to 30,000 cubic feet.**

Bahnson unit humidifiers are self-contained, require no compressed air, steam, pumps, or floor space. Easy to install—uncrate and suspend from ceiling, then make electrical and water connections. Evaporation range up to 12 gals. per hour per unit, using city or well water at ordinary pressures. Single or multiple installations with fully automatic control. Satisfaction guaranteed by America's largest maker of industrial humidification equipment—used by America's outstanding woodworking plants.




**FREE!** Get the complete story on how humidity control can save Dollars, Hours and Headaches in your plant.

Send today for your free copy of this fact-filled booklet. Simply clip coupon to your letterhead and mail immediately.

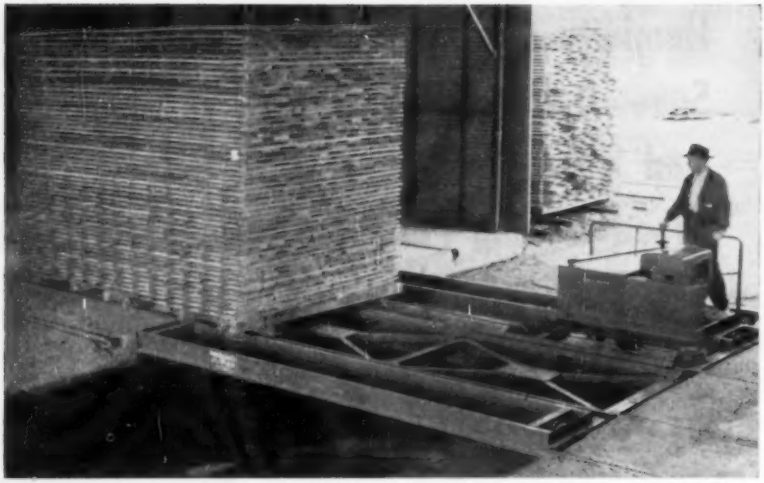
NAME_____

POSITION_____

Bahnson Company

ENGINEERS AND MANUFACTURERS

WINSTON-SALEM, N. C.



Beneke Corp., Columbus, Miss.—Moore Power Car shown pulling kiln load from storage tracks.

# Move Kiln Loads FASTER — EASIER and CHEAPER with Moore Power Car

Put POWER to work—loading or unloading kilns — transferring kiln loads to and from storage.

Moore Power Transfer Cars for small or large mill—end or cross-piled loads—gasoline or electric driven—slow or high speed.

*Write for information—do it today.*

## MOORE DRY KILN COMPANY

Oldest and Largest Manufacturers of Dry Kilns and Veneer Dryers

JACKSONVILLE FLORIDA · BRAMPTON, ONT. CANADA · VANCOUVER, B. C. CANADA · NORTH PORTLAND OREGON

# *Comments from* THE NATION'S CAPITAL

By Arnold Kruckman
Washington Correspondent

It's the custom of Washington correspondents to mildly prognosticate what may be expected in the New Year. It would take more than a Washington correspondent, and more than a White House Palace guardsman, and more than this particular reporter can suggest, to give any clear idea of what is ahead in 1954. The history that is in the making is the kind of history that future centuries will look back upon and wonder what kind of people we were. At any rate, we know that 10% of the individual income tax will be permitted to fade on January 1, and that the excess profits tax will be allowed to go at the same time. They tell us here the 10% income tax everyone will save is bound to be profitable for everyone who makes and sells consumer goods and services. Apparently they expect much of it will go into postponed improvements for homes and for shops and for plants; and that some of it will go into purchase of furniture. Some of the trade organization people here seriously believe it means that more people will buy picture frames, wooden kitchen equipment, wood products that go into offices and into public buildings and everywhere that things made of wood may be used. A pick-up in the trade in the many different wood packaging facilities is expected.

At this writing no one knows what may happen about the social security taxes. As you know, the Administration tried to secure an increase from 1½% to 2%, effective immediately in 1954. But Congress ignored the demand and nothing happened. While this is being written, the President, at the White House, is holding a series of conferences with different members of the Congress to arrange a legislative program to be followed by the Congress after it meets January 4. Each day he has with him the members of different committees from the Senate and the House. We are told that these conferences, scheduled to last three days, are to continue until the program is crystallized

as the White House Palace Guard wants it. Someone passed the word that the sessions would last even until Christmas if it were necessary—which, of course, is an exaggeration. The members of the Senate and the House always have genuinely pressing business around the Holidays that require their presence in a number of places. It is absolutely certain that the White House will approximately get something like the program it wants.

It does want an increase in the social security taxes, and in all likelihood will get the increase from 1½% to 2%, which will be made effective after the bill is introduced and both Houses vote on the question towards the latter part of January. It is interesting that since 1937, $9 billion have been paid out in social security benefits, and $18 billion still remain, theoretically, in the insurance reserve fund. Those who are pressing for the increase declare there would be 28 billion more in the reserve fund today if Congress had not frozen the 1% rate in the '40's. Not long ago 10.6 million more people, including 3,000,000 farmers, 2,700,000 farm workers, 200,000 domestic workers, 400,000 state and local government employees and 700,000 professional men and ministers, were brought under social security. They say there are still six out of every ten workers in your business, in professions, and elsewhere, who should be brought under social security insurance. The U. S. Chamber of Commerce is making a determined fight to abolish the present social security system and to substitute in its place a method by which the size of the benefits and of the reserve fund, and the classification of those who would be eligible, would be determined by each Congress. Much has been made of the apparently true statement that any Congress could stop the social security system operation any time it pleased to do so. This, obviously, is what makes it so much more insecure than regular insurance.

The tax prospect that is of most interest to many businesses is the corporation tax. If the law is obeyed it would be reduced on March 31 from 52% to 47%. In fact, if Chairman Reed of the House Committee could have his way, it would be reduced to 42%. This 10% reduction in corporate taxes is probably the most paramount interest of the 542 trade organizations represented in the Capital. Business wants the law to go into effect, as written, on March 31. But the Treasury and the White House are determined the law shall not go into effect. The Administration thinks it needs every penny of that tax to take care of the budgets ahead, and the obligations that have been incurred for which no preparations have been made.

Another tax, the excise tax, which hits some of the wood products, also will come up for very vigorous discussion. The Administration is opposed to any reduction in any manner. House Chairman Reed and his group particularly press for the elimination of the excises on the small group of products which were added for taxation by the Revenue Act of 1951. This includes gasoline, alcohol, tobacco, etc., commodities which have a huge consumption. There will be a tremendous drive to eliminate some excises in 1954

Government states military spending will reach its peak

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early in 1954, level off, and continue at a rate of $53 billion a year 'til mid 1955. Its experts assert major attention will then be focused on public building and civilian improvements. They state to bring the country's schools, roads and hospitals up to par in the next ten years requires an outlay estimated officially at $98 billion. Bureau of Public Roads estimates $60 billion will be invested during the same time to modernize highways; $20 billion will be spent to repair and maintain existing roads. School people in Government declare new schools are needed immediately which will cost $20 billion, and another $18 billion is needed for new hospitals. The Housing people assert over 5 million houses must go up in the next four years.

James R. Bemis, President, National Lumber Manufacturers Association, looking ahead during 1954, remarks "recent surveys indicate that in 1952 Americans spent more than $3½ billion for do-it-yourself supplies and tools. That's an average of about $77 per householder—$60 of which went for wood products."

Mr. Bemis expects this market will vastly expand in the year ahead. Over-all, he thinks the wood products market should remain relatively stable during 1954. Discussing new construction—which absorbs about two-thirds of the lumber produced in this country—he says that the outlook is for a dollar volume only about 2% below 1953's record figure of nearly $35 billion. Lumber production for 1953, according to Mr. Bemis, is figured at about 38.4 billion board feet—a shade above the estimated output of 38.2 billion board feet in 1952. It is interesting to learn from him that lumber consumption, which includes exports and imports as well as changes in distributors' stocks is calculated at about 40.7 billion board feet for 1953, compared with an estimated 40.4 billion board feet in 1952.

Director John D. Davis, of the Forest Products Division, of the Business and Defense Services Administration in the Department of Commerce, has held a series of get-acquainted meetings during the closing weeks of the old year with the various sections of the industries in his charge. He had one general meeting at which he introduced Commerce Secretary Sinclair and Assistant Commerce Secretary Lothar Teetor to those assembled. The Commerce Secretary explained his concept of the function of the Department of Commerce in Government-business relationships. Much was said about the relation of some parts of the Department of Commerce to the United Nations organizations and specialized organizations of the U. S. Government. Aside from Director Davis, there were present Deputy Director Merrill Lord of the Forest Products Division, Deputy Assistant Director W. LeRoy Neubrech of the Forest Products Division and Al Cline of the Forest Service of the Department of Agriculture. There also were present Charles F. Honeywell, Administrator of the Business and Defense Services Administration; H. B. McCoy, Deputy Administrator, Business and Defense Services Administration, and Walter A. Edwards, Assistant Administrator, Business and Defense Services Administration. Their names are mentioned here because all these gentlemen are expected to play an important part in the future activities of the Government that have to do with the wood product industries.

Colonel M. A. Mathias, District Engineer,Corps of Engi-

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Our field representatives have a *working* knowledge of the glues they sell. They are as at home in your glue room as they are at your glue buyer's desk. If you, too, like to deal with men who know glues — write or phone the National Casein office nearest you today.

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neers, Seattle District, has notified his superiors that invitations in that area to bid on the supply of plywood assault boats has attracted little or no interest; that there have been very few bids in the area. Colonel Mathias has his office at 4735 East Marginal Way, Seattle, Washington.

The National Distribution Council of the Department of Commerce which works on the assembly and dissemination of market information recently had a meeting. Sid L. Darling of the National-American Wholesale Lumber Association, New York, is a member. Sherman Adams, Assistant to President Eisenhower, spoke at the banquet of the Forest Congress here, and was given a plaque to commemorate his services to the industry.

Leonard G. Carpenter of Minneapolis, President, McCloud Lumber Company of Wisconsin and California, was elected President of American Forest Products Industries, at a recent annual meeting. He succeeds James L. Madden, Boston, President, Hollingsworth and Whitney Co.; Walter J. Damtoft, Champion Paper and Fiber Co., Canton, N. C., Vice-President; William Swindells, Willamette Valley Lumber Co., Vice-President; W. B. Greeley, Port Gamble, Wash., Chairman of the Board; P. H. Glatfelter, Spring Grove, Penn., Treasurer; and C. A. Gillett, Secretary and Managing Director.

A new type of apartment construction has been introduced in the Capital area. We are told it is seen more often on the West Coast than elsewhere. The units are reported to be renting faster than they can be completed. The apartments are made of exposed plank and beam construction and utilized a million board feet of Douglas fir and Southern yellow pine lumber. They have large glass areas, and rent—two bedroom units—for $59.50 and $77.50 per month. They tell us six buildings, with a total of 106 rental units, will be completed in January, and another six buildings, on a forty-three acre tract, will be ready for occupancy in April or May. They tell us that the Capital is the birthplace of the trussed rafter system for home building. It began here with the Civilian Conservation Corp program in 1933. It is recorded that more than 2,000 builders have built more than 125,000 houses with these trussed rafters.

Teco announces a new, quick-setting industrial adhesive, particularly developed for furniture, woodworking, and plastic-to-wood fabricating. It is a two-part resin adhesive that requires only ten minutes,at room temperature, from clamping to machining. A shear strength of 500 pounds per square inch is developed in this short period, while near-ultimate strength of around 3,500 p.s.i. are not uncommon with dense hardwoods after twenty-four hours. It's odorless, and requires no special ventilating or handling equipment for mass production. It does not stain wood.

Large quantities of Douglas fir were purchased by Formosa for construction of military barracks, warehouses, shops and manufacturing plants. It also sought bids for nearly 3 million board feet of veneer logs, mostly originating in the Philippines, also to be used in the construction of barracks in Formosa.

The Anderson Coach, produced by
Anderson Coach Company, East Tawas, Mich.

# What! No Nails?

That's right—nails for structural use have been outlawed in the Anderson Coach! Dielectric wood welding with Cyanamid's URAC® Resin 185 makes joints actually stronger than the wood itself . . . incomparably stronger than nailed joints.

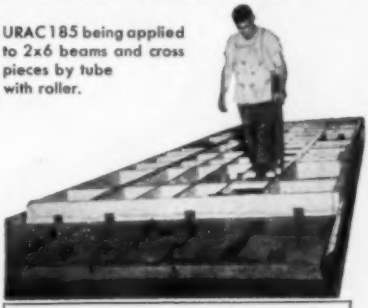
This moisture-resistant urea-formaldehyde resin adhesive makes bonds that will not buckle, weaken or delaminate even when soaked in water and various acids! Look at these typical tests made by Anderson:

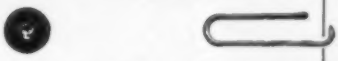
- Five pieces of spruce bonded vertically to a flat piece of birch plywood and submerged in water in December, 1949, are still solidly bonded.
- So are pieces of birch and spruce bonded to fir plywood and sealed in a jar containing ammonia and water in April, 1952.
- Similar tests made in solutions of 100% and 50% muriatic acid have affected the wood but not the bond!

The use of URAC 185 is typical of the advanced construction methods that make the Anderson Coach one of the best trailers on the market. Stressed-panel construction of sidewalls, roof and platform, securely bonded with URAC 185, makes the Anderson Coach stronger and safer.

If you, too, want strong, sure bonds—even "nail-less welding"—write for complete information on how, where and why you can use URAC 185 in assembly gluing of wood, or the laminating of veneers, hardboards, plastic laminates, etc.

URAC 185 being applied to 2x6 beams and cross pieces by tube with roller.





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With two drum sanders set at right angles to each other, moulded plywood chair-backs are quickly passed from one machine to the other in a fast-moving, uninterrupted flow, and emerge sanded both back and front. The abrasive is BEHR-MANNING® ADALOX® Cloth, 80-X CLOSEKOTE,® smooth-cutting and long-lasting.

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*For the newest in coated abrasives... watch BEHR-MANNING!*

**Now** in addition to its many other services to the woodworking industry, WOOD WORKING DIGEST has decided to take this form of commending the efforts of those associations and firms who are doing most to help maintain and develop the demand for wood products.

**In View** of the difference between the activities of associations and companies within the industry, the contest will be conducted in two categories—one for the associations, the other for the companies.

**For 1953,** the judges will select one winning entry in each classification for both the association and the company divisions.

**In addition** Honorable Mention citations, providing recognition to selected entries other than the winners, may be issued at the discretion of the judges. Duplicate awards shall be given advertising agencies that have prepared a winning contestant's campaign.

**Each winner's** citation will be a handsomely mounted scroll beneath a polished lucite plate on polished beveled wood base. Winners will be publicly announced and awards made at the Annual Meeting of the Forest Products Research Society to be held at Grand Rapids, Michigan, May 5-7, 1954.

**The contest** will be open to those companies or associations that, during 1953, have promoted (1) the desirability of wood for use over other materials and (2) the use of wood products.

**The "desirability** of wood" is defined as meaning promotion of a general nature suggesting wood as usable material. And by the "use of wood" is meant anything that is made of wood in any form.

**There** will be five divisions of entries which will be open to both associations and companies as follows:

(a) lumber, dimension stock, veneer, plywood.

# Wood Working Digest

# AWARD OF MERIT

## Contest

*In Recognition of outstanding service in the promotion of Wood and Wood Utilization*

## Open to All Associations and Firms

(b) products made from wood waste
(c) finished wood products (furniture for example)
(d) wood components for structural or other parts such as beams and girders, boat timbers and plane parts
(e) machinery and materials that make possible a more expanded market for wood.

**In addition** to the citations, winners will be announced and their entries displayed at the F.P.R.S. meeting. They will also be published in WOOD WORKING DIGEST. We are assured that the WOOD WORKING DIGEST Annual Award of Merit will be a coveted and appreciated distinction and that the winners will be making an outstanding contribution to the industry. As such they will be given local and national publicity.

**The selection** of the award winners will be made by a committee of individuals representing both industry and association groups.

**All voting** returns will be held in strict confidence insofar as committee member voting is concerned. Committee members will not vote on entries in the classification they themselves are in.

**For full information . . .**

**Use postage free post card opposite page 160.**

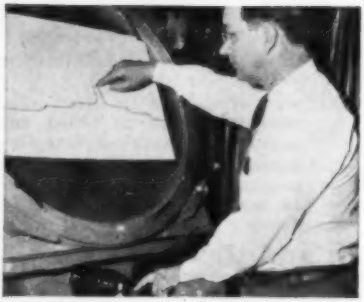
**All contest entries must be in by March 19, 1954.**

Here's why Diehl Cutterheads—known throughout the woodworking industry for their perfect balance and long-life cutting edges—*give perfect profiles.*

To obtain absolute precision of contour, Diehl Cutterheads are tested with modern optical comparators which permit precision measurement against original engineering drawings. The result is exact contour—*you* benefit by getting Cutterheads capable of turning out volume production to exact dimensions.

Contact your nearest Diehl Representative or the Diehl factory—ask for Condensed Cutterhead Catalog—Bulletin No. 452.

CUTTER DIVISION



Diehl expert points to magnified cutterhead contour—projected on screen of comparator.

On the Banks of the Wabash

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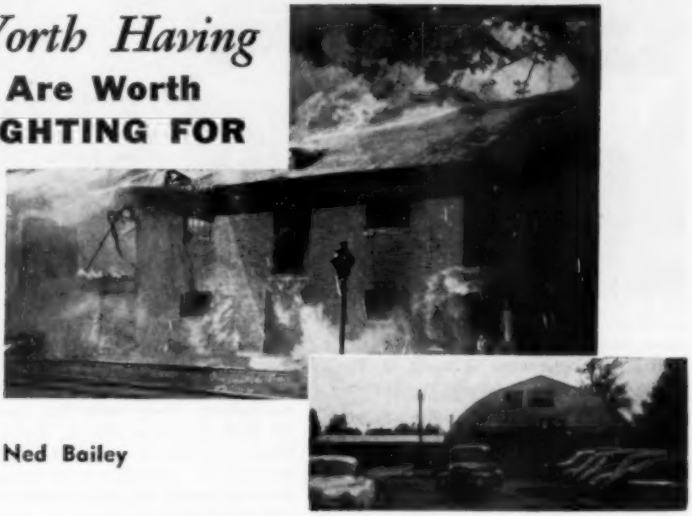
# *Things Worth Having* Are Worth FIGHTING FOR



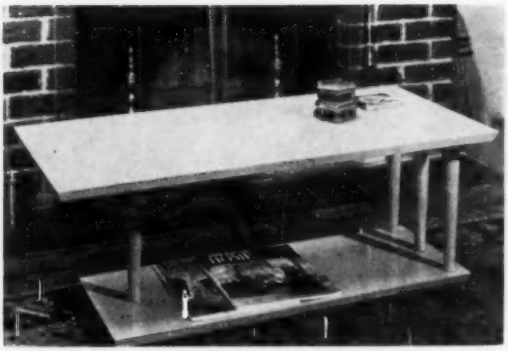
By Ned Bailey

I HAVE been traveling over the country for many years, looking for stories about wood products and their manufacture. After many years, you might expect my work to assume a boring monotony, but it certainly has not done so to date. As a matter of fact, not only is it far from boring, but each new contact, with a factory organization and its product, seems to have a distinct personality and character all its own. Ingenuity and originality, both in product design and production keep showing up, proof of the continued effort to make better things in a better way—which I believe we call "The American Way."

A case in point, combining ingenuity and originality, is the Atex Manufacturing Company, Inc., of Stamps, Arkansas. They add two other ingredients that often mean the difference betwen success and failure—unlimited courage and confidence. In the few short years of their existence, they have had trials and tribulations that would have completely discouraged a less scrappy outfit. Instead of giving up, these young men have fought their way up, through fire and design copying by competitors, to achieve the success they now enjoy.

A brief biographical sketch of the executives who head the Atex Manufacturing Co., of Stamps, Arkansas, and the company's experiences, will, I hope, interest you as much as it has intrigued me.

Several years ago, two young men, Al White and Roland Drysdale, were classmates at Port Arthur College at Port Arthur, Texas. While there, they became real buddies, and when Drysdale, a native of Florida, married a girl from that state, White decided he would do likewise. These wedding bells didn't ring until after both men had completed their technical training. The



**Cocktail table 20" x 40" two shelves and legs combed grain rift oak finish.**

buddies and their brides then went down to Rio de Janeiro, Brazil. Drysdale and White both went to work for Pan-American Airways as flight officers.

The bonds of friendship continued to develop between these men and their families while living in Rio. When Al White and his family left Pan-American at Rio and returned to his home at Stamps, Arkansas, he often thought of Roland who had returned to his home in Miami, Florida.

Al was looking around for a business to enter, and welcomed his father's suggestion of getting into furniture manufacturing. His uncle, J. C. McHahen, had spent 15 years with the Camden Furniture Company, of Camden, Arkansas. He was at that time, seriously interested in branching out for himself. After Mr. White had several conferences with his uncle, they decided to form the Atex Manufacturing Co., and located at Stamps. As their letterhead states, they were to manufacture modern occasional tables. "Furniture With A Future" they call it. Drysdale was sent for, and joined the organization immediately. He was placed in charge of design and office management, White was in charge of sales, and McMahen, production.

For a factory, they rented an old brick building on the outskirts of town, which had formerly been used as a canning factory. This building was modeled and equipped with needed woodworking machinery. They went into production in 1950, starting slowly, feeling their way, both as to product design and production procedures. It was decided that it would be more economical, in the beginning at least, or until their volume developed, to buy the component parts of their tables, and do the assembling and finishing in their plant.

Although sales got off to a slow start, it wasn't too long before the furniture trade in the deep South "caught on" to their line, and orders began coming in satisfactory quantity. Their decision that good design and quality at a moderate price would get the business proved correct. Then, too, impetus was given their sales through their development of several new and original designs, made to meet the buyers' desires. In fact, business was so good, they bought the building they had been renting.

Then came all but a knock-out blow, that would have put some less hardy souls out of business. With two carloads of complete tables, ready to be shipped, the building caught fire. The plant, the equipment and the two carloads of fur-

**Part of the shop force. Men and women work side by side at Atex. They certainly struck me as a family working together for their mutual benefit. Mr. McMahen, who is in charge of the shop is certainly proud of his crew.**

niture all went up in smoke, with insurance covering only a fraction of the value.

You could honestly say their business was "Gone with the Wind," for it had been a strong wind that blew the flames from a grass fire outside the building into the exhaust opening of the finishing department, igniting the fumes. Gone was the money they had pooled to start the business, gone was their plant, materials and equipment, the finished tables referred to, and thousands of parts ready for assembly. The building was a mass of rubble within an hour. One fact, however, all were thankful for, no one was seriously injured.

Between one thing and another, many would think these young men should have had enough of the furniture business, but they didn't. Their unanimous decision, and that of their wives, who had all "duffed" in and helped from the very start, was "not to quit, but try and build back, what with the orders coming in as they were, there was no sense in giving up." So the Atex Company went back into business.

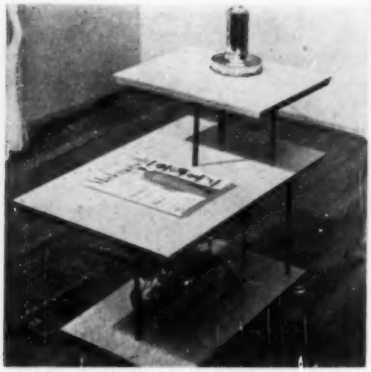
The local admiration for these men took a very realistic form. Their fellow townsmen formed a "stock" company to help Atex get going again. City folks and farmers, everyone who possibly could, bought stock. The result was, that with what Atex had gotten in the way of insurance and the amount their friends and neighbors had subscribed, a new building was built and equipped. This time, it was a fire proof building, and, although it is a little small now, it was ample to take care of them then.

The fire took place Sept. 25, 1952, a little over a year ago. When I was down there in August to visit them, they were going along as though nothing had happened. The only trouble (if you can call it trouble) they were experiencing was keeping up with their orders.

They included several interesting features in their operation, design and manufacture procedures. First, they have come to the conclusion that they can buy top quality parts cheaper than they can make them.

Atex tables don't just happen. It often takes about a year to create and engineer a new table. Designing a number

**Left to right: R. W. Drysdale, secty.-treas.; J. C. McMahen, pres.; A. L. White, vice-pres. & sales mgr.**



**Another 18"x28" three-shelf end or step table. Shelves same as shown in preceding illustration, legs of black wrought iron.**

that is both beautiful and strong, practical and easily assembled, is not a simple matter. After a table is designed and passes the "ease of assembly" test, it then gets a rough going-over to test its strength. I was amazed to see 180-pound Mr. Drysdale walk up the steps of the "step-table", and do a jig on the top of others.

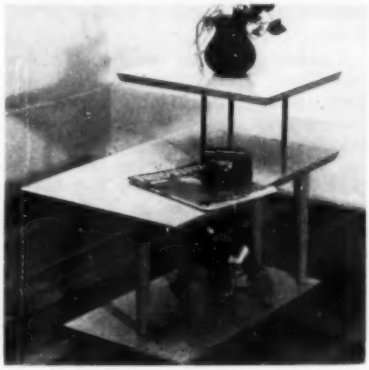
Their KD assembly is so simple that the furniture dealer can have a porter, or anybody, in fact, put the tables together in a few minutes. They tell me that the time taken for engineering study and construction tests has more than paid off, and is one of the reasons for their success. Because of this study, they have preserved the best in design and construction, yet the KD assembly is so simple "even a child" can assemble their tables without going wrong. No special tools are needed and all connections are metal to metal.

Some of their earlier groups were built and shipped setup, and packed in specially designed cartons. During shipment, these products were in a "full floating" container, practically eliminating all damage.

Because of their ability to ship their new lines KD, the saving to the customer in freight charges is considerable. Storage, too, at the plant, and at the retail stores is simple and space saving, effecting more valuable economies.

I was interested to find, as I mentioned before, that they fabricate only, buying their dimension stock from the E. A. Stewart Lumber Co. of Texarkana, U.S.A.; plywood from Owosso Manufacturing Co., Benton, Arkansas; and wrought iron from the Arkansas Machine Specialty Co. of Hope, Arkansas.

Their labor is all recruited locally, and has been developed into a very competent group. Knowledge of what their employers have gone through, plus a total lack of "boss" attitude on the part of management, has produced a splendid working arrangement. When



**Same table as shown before showing wrought iron legs above and oak legs below.**

some special "rush" order comes in a few minutes before closing time, everyone digs in to help get it out "right now." Both men and women are employed, and Mr. McMahen, in charge of production, says he doesn't know which perform the better, although he

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**plywood**
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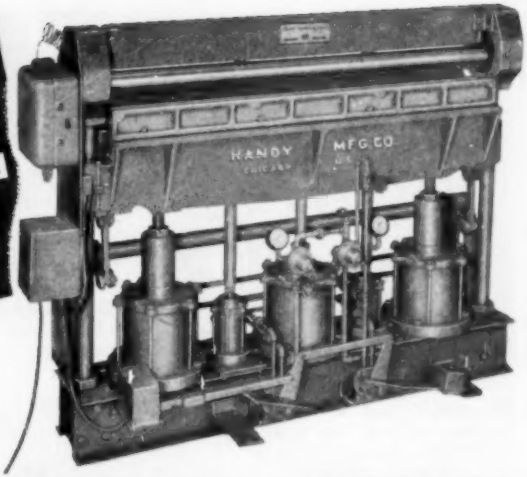


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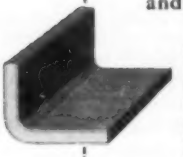
*Air-powered production bending* is the sure way to make your products more saleable and at lower cost. Remember—every bend eliminates a costly machined joint and the use of material like plywood gives greater strength with thinner stock.

*Fully automatic* Handy Bending Presses provide the only method proven for over 15 years by makers of furniture, trailer coaches, luggage, desks, displays, sewing machine and TV cabinets. These presses are simple to operate even by women; nothing to do but step on the air valve and bending is fast and precise.



*6 Standard sizes* of Handy Bending Presses make bends up to 153" long with radii from 1" to 5", 90° or more or less. It is easy to make one or more accurate bends in each workpiece; the design possibilities are endless. Write today, stating your problem.

**MOLD VENEERS AND PANELS, TOO**

Handy also makes Molding and Forming Presses for parts with contour or thickness requirements best met by production in electrically heated dies. When it takes controlled heat and pressure, call on Handy.

*HANDY Manufacturing Company*

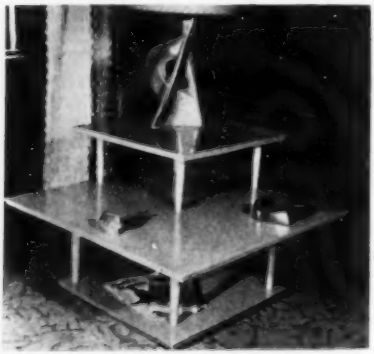
2436 West Lawrence Avenue • Chicago 25, U.S.A.

**Three-shelf end or step table. Both shelves and legs are combed grain rift oak finish. Outside dimension 18"x28".**

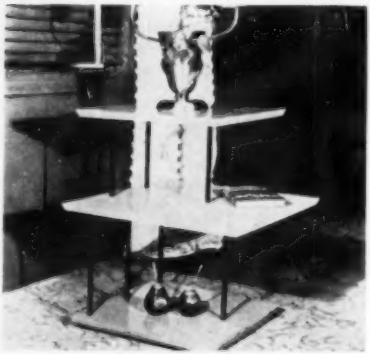
does feel the women are better for finishing work.

In creation of their designs, many factors are taken into consideration. Some of the new numbers in the 700 series, as they call it, are typical. These pieces are, they believe, ideal in size to accompany nine out of ten modern upholstered pieces, and living room settings. Sizes of the 700 series are: step and end table, 18" x 28"; lamp table, 22" x 22"; cocktail table, 20" x 40"; and the corner table, 30" x 30". Atex designs are not only different and beautiful, but they have real functional utility. A good example is the bottom, or floor shelf, which provides an ideal place for planters, magazines, books, etc.

The finish on their tables is also their pride. They are using both duPont's and Sherwin-Williams' new type synthetic products for which the manufacturer claims a remarkable color retention quality. Other features of this finish are that it cannot be marred by water, alcohol, acid, or even lacquer thinner. Their tops are combed grain rift oak, hand picked so that all will match. Legs are either wrought iron or solid oak specially turned. They also make tables with a black-gray "silver fox" finish.



**Corner table 30" x 30" shelves and legs are combed grain rift oak finish.**



**Lamp table 20" x 20" wrought iron legs and combed grain rift oak finished shelves.**

In closing this story about three fighting southerners, I want to mention, that while I was there, orders for hundreds of Atex tables were coming in on the phone, by wire and in the mail.

Yes, these courageous young men are fighting their way up. Watch them grow.

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It's a Pleasure to Operate...

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HIGH SPEED BAND SAW

Cuts are made so smoothly, effortlessly, even in multiples as thick as 2 feet. Geared Guide Post and other conveniences make adjustments so easy. The built-in dust syphon takes care of the dust regardless of blower system. And the machine is absolutely vibrationless. No wonder that bandsawing production vastly increases where these machines are installed. It's a pleasure to operate a Tannewitz High Speed Band Saw.

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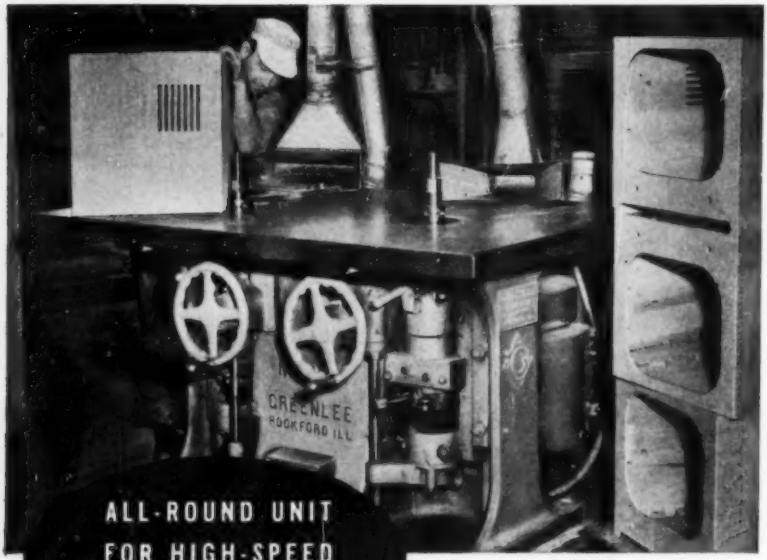


# ALL-ROUND UNIT FOR HIGH-SPEED PRECISION SHAPING

*. . . Greenlee No. 180-B Motor Driven Shaper*

Here's the *double-spindle* Shaper that you find speeding production in so many leading woodworking plants today.

Its size, spindle spacing, and design for extremely high spindle speeds, makes the GREENLEE ideal for high output of light or medium-heavy work. And its belted-motor-driven feature eliminates need for a separate frequency changer.

Since the success of any shaper depends mainly on its spindles, all GREENLEE Shapers have spindles that are designed for maximum strength and rigidity. Of alloy steel, scientifically heat-treated, they are capable of withstanding hard shocks and stresses and still maintain their original fine balance. Equipped with precision ball-bearings, they operate at high speed with maximum smoothness.

Rugged frame construction, proper table design, highest quality materials and fine craftsmanship throughout all combine with the other many features to make this an outstanding machine of excellent reputation.

For accurate, high-speed shaping and long-time, trouble-free service, investigate the GREENLEE No. 180-B Double-Spindle Shaper. Write today for complete specifications . . . ask for Bulletin No. 180-B. Greenlee Bros. & Co., 1861 Twentieth Ave., Rockford, Illinois.

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GREENLEE WOODWORKING MACHINERY: MORTISERS • BORERS • SAWS • TENONERS • PLANERS • SHAPERS • MORTISING and BORING TOOLS

# Evolution of LUMBER DRYING TECHNIQUES and DRY KILNS

## Part 2

**By Paul H. Graham**

OTHER wood seasoning methods have been or are being used to a limited extent. Some of these have been used in conjunction with conventional air drying or kiln drying and others are complete seasoning processes in themselves designed to dry lumber to a desired moisture content. The more important of these methods include: superheated steam drying (which will be treated in a later kiln drying article), boiling in oil, chemical seasoning, solvent drying, vapor drying, vacuum drying, infrared radiation drying and electronic or high frequency drying. Other methods which have been tried at various times but which to date have been found economically or technically impractical might include: centrifuging, electrical resistance heating and electrolysis.

### Boiling-in-oil Process

As used in drying lumber the boiling-in-oil process provided heat required for evaporation of moisture by submersion in hot oil. The operation is usually performed in a steam retort equipped with some adequate heating device, such as a steam coil, and a vacuum pump to draw off the liquid. Various types of oil or water repellents with a boiling point much higher than that of water have been used but creosote oil seems to be generally favored for this process. The wood is usually submerged in cold oil and heat is applied gradually until the oil reaches a temperature above the boiling point of water.

Only those woods which have a very high critical temperature or can withstand a very low relative humidity without end checking, splitting and surface checking can be treated successfully by this process, due to the steep moisture gradient set up in the wood. Tests have shown that pervious woods which permit rapid movement of liquids and vapors give best results. Honeycomb has been the most common result from the use of high oil temperature greater than the critical temperature of the wood.

In a report published by the Northeastern Wood Utilization Council bulletin, Raymond C. Rietz, chief, Division of Timber Physics, Forest Products Laboratory states: "While the sapwood of most species could probably be dried in this manner without serious losses, the heartwood of very few species can stand the very steep moisture gradient set up, because of the lack of relative humidity control. If the diffusion of water from the inside of the wood to the surface is fast enough, the moisture gradient remains relatively flat and the stress gradient is not sufficiently severe

to cause surface checking. When the diffusion of moisture, however, is relatively slow, as is the case in most hardwoods, a very steep moisture gradient is quickly established and checking is likely to result, even though the period during which the wood is subjected to these higher temperatures of boiling-in-oil is much shorter than that in the conventional dry kiln equipment."

The use of the boiling-in-oil process is not suited to drying impervious or refractory woods, nor to volume drying of lumber, and is confined chiefly to special quick drying of small lots of lumber or timbers of species that are compatible to this kind of treatment. Its best application is probably as a preliminary treatment to wood preservative processes. The oil in the dried wood is often a nuisance. Oil take-up makes the process expensive and subsequently interferes with many uses, if preservation is not involved. It would seem to be too expensive for general application on the basis of cost of unit of heat generated and drying medium employed.

**Chemical Seasoning Process**

Chemical seasoning is not truly a drying process but rather a treatment to reduce or prevent checking during subsequent air drying or kiln drying. It involves the application of a suitable hygroscopic chemical to green lumber, in the form of a liquid solution or powder, to impregnate the outer zones of the lumber to sustain a higher moisture content at the surface of the lumber, which tends to eliminate checking under drying conditions severe enough to cause untreated lumber to check. Chemical seasoning in itself does not increase the normal rate of drying, but more rapid drying is possible because it permits the use of more severe accelerated drying schedules.

Chemical impregnation of the outer layers of lumber does not interfere with drying, even though the moisture content in the surface fibers is generally higher than the interior portion of the board which is not treated. The chemically free water in the interior has a normal vapor pressure and diffuses to and is evaporated from the surface under control of the relative humidity of the surrounding atmosphere, just as in the conventional air-drying or kiln-drying processes. Good results depend upon maintaining a proper balance between the relative humidity of the air and the vapor pressure of the chemical solution in the wood.

Various chemicals have been used in chemical seasoning. Common salt is probably the most effective, but since it has a tendency to corrode metals it may damage dry kiln equipment, woodworking machinery, metal fasteners or any hardware that comes into contact with the treated wood. This tendency naturally limits its field of application. A proprietary chemical seasoning agent is currently being offered for wood treatment purposes which is said to consist chiefly of common salt yet is claimed to have anti-corrosion properties which may solve this problem.

Crystal urea was used rather extensively during World War II for treating Douglas fir pontoon stock but is not known to be used to any great extent today. This is an economical chemical but is somewhat variable in effectiveness and is not reliable for treating some species. A urea-formaldehyde solution has been found to be very effective but its expense limits its use. Diethylene glycol has been recommended for chemical seasoning but it too, is relatively expensive and is said to be still undergoing investigation of its relative merits.

Sugars have been found to be very effective in anti-checking treatments, particularly in solution with a hygro-

scopic chemical. Invert sugar, molasses and other low grade sugars have been used, but low grade sugars also have a tendency to discolor the wood and to limit its use to applications where discoloration is not considered a defect. On the other hand, the sugars do not cause corrosion of metal.

Chemical application ranges from spreading dry salt to soaking in saturated solutions and treatment cost will vary with material and treatment method employed. In the dry spread application the chemical is spread between lumber courses in a bulk or solid pile and left in contact until absorbed. It is estimated that from 60 to 100 lbs. of chemical is required per thousand board feet of lumber using this method.

While cost of application is substantially greater, application of the chemical to the lumber by brushing or spraying is quicker. The chief problem is the application of chemical coats of sufficient thickness to provide the required impregnation. This is sometimes accomplished by the use of a thickening agent, such as starch, and a proprietary mixture is available which makes a thickened solution upon the addition of water eliminating all the problems of making a starch-thickened paste. After treatment by brushing or spraying, the chemically-coated lumber is stacked on thin stickers to allow absorption of the chemical into the outer zones.

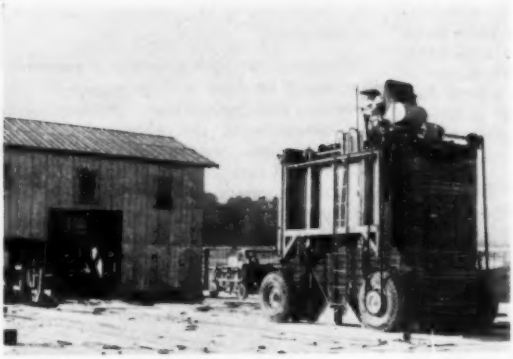
Dipping requires additional investment in the form of a tank but is a fast method of application. As with brushing and spraying, application of a sufficient quantity of chemical is sometimes a problem. Soaking is probably the most efficient and most expensive method of chemical application, since a greater quantity of chemical is required together with tanks and other equipment. The chemical will discolor in use and unless replaced will discolor the wood. The customary soaking treatment is about 3 days per inch of thickness.

Chemical seasoning is not a cure-all nor can it be used with impunity on all species. It is relatively expensive and the presence of the chemical in the wood confines the use-applications of the treated lumber. Wood discoloration is quite common and the element of corrosion present in many chemicals prohibits their use for lumber that is to be used for wood products or other lumber which requires much machining. Some chemicals also are not compatible with standard paints and finishing materials.

**Solvent Drying Process**

Solvent drying as a commercial wood seasoning process is said to have been developed by the Western Pine Association in the early 1940's, as a means of drying ponderosa pine to not only remove excess moisture from the wood, but also to raise the grade of pitchy lumber by removing pitch and other extractives. Lumber was stacked vertically in a retort and was sprayed with the vapor of a mixture of acetone and other solvents with an affinity for water, heated to a temperature of about 180 degrees F. This liquid is a solvent for water, pitch and other extractives present in ponderosa pine.

Processing time in the spray bath was reported to be about 6 hours, during which time the vapors absorbed moisture, pitch and other extractives from the wood and were condensed. Equipment was designed to draw off this condensate, which was distilled to remove the extractives, and the solvent was reheated to be returned as a vapor. Final drying was accomplished by blower circulation of hot air through the treated lumber for a period reported as about 4 hours. The cycle was repeated constantly until the required moisture content of the lumber was reached.



**Unit-package lumber handling by Ross fork lift truck.**

This same general solvent drying process was subsequently applied by the West Coast Lumbermen's Association to Douglas fir, with unsatisfactory results being reported in contrast to reports that it was quite efficient and rapid in its application to ponderosa pine. It has been said that the difference in results might have been due to difference in properties of the two species, as the Douglas fir is denser than ponderosa pine and less pervious.

Due to the special expensive drying equipment required, substantially higher operating costs, and highly technical operation, this solvent drying process would not appear to be an economically feasible replacement for conventional kiln drying. Its practical application would appear to be for such species as ponderosa pine, to remove pitch exudation defect and up-grade the lumber product. The relatively higher cost of drying in such applications might be partially offset by the recovery of valuable by-products from the extractives removed. In the final analysis, few commercial wood species have the high critical temperature and low critical relative humidity properties that can withstand this severe treatment without damage and substantial loss.

**Vapor Drying Process**

The vapor drying process was originally developed for partial drying of poles, timbers and ties prior to preservative treatment and its current applications are confined chiefly to this field. Commercial equipment required for this process generally includes: an evaporator, drying chamber, condenser, separator and condensate return tank, designed to withstand 24 to 28 inches vacuum. The drying chamber is usually constructed in the form of a steel cylinder because wall thickness required to resist externally-applied pressure is less in a vessel of cylindrical shape than rectangular.

The first publicized development of the vapor drying process was in 1910 when Besemfelder developed such a process in Germany for the purpose of recovering valuable extractives, although it is not known to have been commercially successful. The principal vapor drying process in current use was developed by the Taylor-Colquitt Company and was patented by Monie S. Hudson in 1940. His description of this process states:

"Drying by means of the vapor drying process is accomplished by exposure of wood in a closed cylinder to the action of vapors from boiling or-

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ganic liquids at atmospheric or subatmospheric pressure. The vapor generated by boiling suitable organic compounds in an evaporator of conventional design is introduced to the vessel containing the wood in sufficient quantity to maintain a high concentration of the chemical in the atmosphere of the drying vessel.

"Any appreciable dilution of this atmosphere by steam formed by vaporization of water from the wood is prevented by continuous displacement of the mixture of steam and organic vapor from the drying vessel by the inflowing dry organic vapor from the evaporator. The mixture of steam and organic vapor discharging from the drying vessel is condensed and the liquids separated by gravity in a tank suitably designed, the water discharging and the water-free drying agent being returned to the evaporator where it is revaporized to begin another circuit through the system."

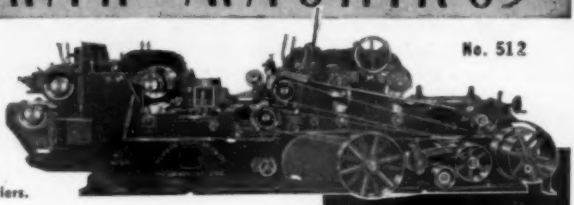
The vapor drying process is usually carried out at atmospheric pressure and at a temperature of about 300 degrees F., and drying agents used generally are xylene, coal tar or petroleum fractions with narrow boiling ranges and initial boiling points in the range of 212 to 400 degrees F. The vapor by passing over and condensing on the wood contained in the cylinder supplies heat quickly and readily to the wood, to bring its contained moisture rapidly to the boiling point. Steam is generated and with proper arrangement for escape, drying is rapid. Accelerated drying results principally from the drying atmosphere of practically 0% of relative humidity and the high temperature used.

This process has a tendency to set up a very steep moisture gradient from surface to interior of the wood, setting up stresses which cause checking and casehardening. This condition is minimized somewhat by using short cycles of alternate heating and vacuum instead of a long continuous heating period followed by a final vacuum. These are not serious defects, however, in the drying of poles and railroad ties prior to preservative treatment to moisture content ranges of 40% to 25%.

Experiments have been made with the vapor drying process to dry lumber, in which Southern pine was dried to 5% moisture content in about 5 hours in 1" thickness and other pervious woods were dried to a similar moisture content in 7 hours. The rapid drying, however, caused considerable checking in sapwood and casehardening in both

# NEWMAN MACHINES

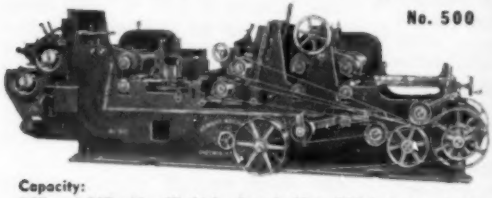
**Newman**



**No. 512**

Capacity: 16" and 24" wide, 8" thick.
Speeds up to 325 feet per minute.
8" dia. cutting circle.
Six 12" dia. feed rolls.
Single and double profilers.

## BALL and ROLLER BEARING PLANERS AND MATCHERS



**No. 500**

Capacity:
14" and 24" wide, 6" thick. Speeds 40 to 200 feet per minute. 7" cutting circle. Six alloy steel feed rolls. High carbon special alloy steel cylinders. Single or double profilers.

The ball bearing NEWMAN 71 (shown below) will grind all sizes of cutter heads. Table is 33" long by 9" wide with horizontal travel of 25" and is heavily ribbed to maintain accuracy over entire travel. Maximum cutter head swing is 11".

**HEAD GRINDER**

**No. 71**

**ORDER NOW FOR EARLY DELIVERY**

Ball and Roller Bearings

ALL NEWMAN cylinders or heads are DYNETRICALLY BALANCED insuring an accurate and superbly finished product.

**No. 55 AUTOMATIC PINEAPPLE FEED TABLE**

The NEWMAN 55 feeds stock automatically to high speed planers and matchers up to 450 lineal feet per minute. Capacity: 30" wide, 8" thick. All adjustments and controls are centrally and conveniently located.

**No. 8-B PLANER, MATCHER AND MOLDER**

The NEWMAN 8-B planes 22" wide and 8" thick, joints 4" thick and will match 14" wide. 6" diameter feed rolls. Speeds of 30, 50 and 75 feet per minute.

MAY WE SEND YOU FULL DETAILS?

Unsurpassed for work in small and medium mills

**NEWMAN MACHINE COMPANY, INC.**
**GREENSBORO, NORTH CAROLINA, U. S. A.**

sapwood and heartwood in many instances, indicating the process is best suited in lumber drying for those items in which checking and casehardening are not objectionable defects.

The use of polar drying agents which serve to keep the wood swollen during the period of heating in vapor is said to have materially reduced the tendency to collapse of refractory species and experiments conducted in this field may yet come up with an efficient lumber drying process.

In general the equipment required for vapor drying is quite complicated and expensive. Until its tendency to create checking and casehardening can be eliminated, the process would appear to be best suited to part drying of poles, timbers and ties prior to preservative treatment rather than for drying commercial lumber for use in the manufacture of wood products. It might possibly be used to advantage in drying some types of construction timbers and lumber where speed of drying will offset possible defect disadvantages.

**Vacuum Drying Process**

The vacuum drying process has been used chiefly in preparing wood for preservative pressure impregnation, where a low moisture content is not required. It involves placing wood in a closed cylinder and heating it under a vacuum. The chief action of a vacuum is to speed up the rate of evaporation of moisture from the surface although it does also aid in the movement of free water to a slight degree. There is some difficulty in applying heat since air is the vehicle used to carry heat to the lumber and the introduction of a vacuum complicates the transfer of heat. This is remedied somewhat by running alternate periods of vacuum and application of heat to the lumber with conditioned air or steam.

A lumber drying process which uses the basic principles of the vacuum drying process, employs a cylinder with a steam jacket to hold the charge of green lumber. A petroleum base liquid is introduced to the chamber until the level of the lumber load is reached and the chamber is heated quickly to a temperature of 230 to 235 degrees F. This temperature is held while a vacuum pump operates to empty the chamber. Water in the wood is heated and forces itself out under vacuum which lowers the boiling point and takes out through a barometric column the resultant vapor to be exhausted into the outside air. The liquid is pumped out during the operation and stored in a tank for re-use.

This process is said to have dried 4/4 Douglas fir to a moisture content of 12% in 3 hours 40 minutes and 4/4 yellow pine in 3 hours. It is also claimed that any pervious wood can be dried stress-free by this process but actual commercial data was not available at the time this was written.

The basic vacuum drying process, however, would seem to be commercially feasible for drying wood preliminary to preservative pressure impregnation treatment only, using the same cylinder for drying that is used for treatment. This application requires elimination of only the more easily removed moisture from the wood, free water near the surface of the lumber, and methods of conveying heat provided should be adequate using the alternate cycle method.

**(To be continued)**

**NEW LAB FOR BORDEN**

The Borden Company's Chemical Division has concentrated its general research facilities in a new laboratory in Philadelphia, Pa. The new Research Laboratory will augment the division's present development and applications laboratories on the East and West Coasts, which specialize in wood gluing, fir plywood and hardboard adhesives and plastic molding compounds.

## *Increase* CUT-OFF SAW Production

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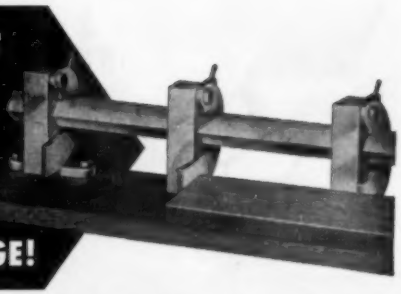
## COMET

## ADJUSTABLE STOP GAUGE!



**COMET Stop Gauges are faster because:** Stops can be positioned anywhere on the bar by hand. Additional stops can be added to the bar without dismounting it. Balanced stop trigger swings easily out of way when not in use.

**COMET Stop Gauges are more accurate because:** Cold rolled steel bar is engraved in 1/16" steps and can not be marred by stop clamps. Machined stop trigger is set to mark—no guess-work on rough stop castings. Work forces stop trigger against block (not away) for perfect alignment.

**COMET Adjustable Stop Gauges** are available in lengths from 8 to 20 ft. All parts are heavily plated against corrosion. Can be used on right or left hand installations. Price of 8 ft. bar with four stops: $34.00, F.O.B. Los Angeles.

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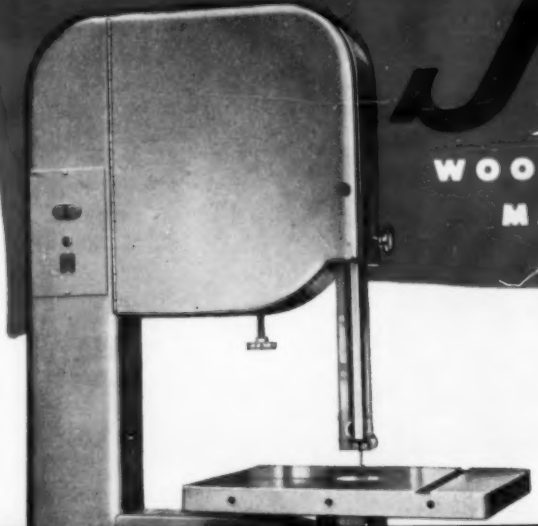
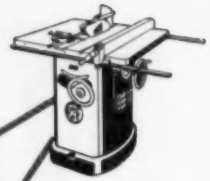
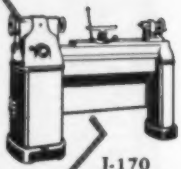
# J-LINE

WOODWORKING MACHINES

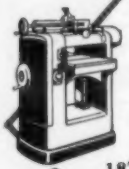




J-120
20" Band Saw



J-170
12" Lathe



J-180
18"x6" Surfacer

J-131

- COMPLETELY EQUIPPED READY TO INSTALL
- DESIGNED FOR SAFETY
- STURDILY BUILT
- EASY TO OPERATE AND MAINTAIN

J-131
8" Jointer

J-147
Combination Disc & Belt Sander

J-145
Spindle Sander

J-150
Shaper

J-140
Mortiser

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# WE, WORKERS IN WOOD, MUST ALWAYS BE WOOD CONSCIOUS

**This fine promotion for wood first appeared in the December 1932 issue of WOOD WORKING DIGEST. Following this short article is an up-to-date appreciation of wood written for us by Ray C. DuBrucq.**

1. Arising in the morning from a bed made from wood, you step on a wood floor and continue to do so almost continually until retiring at night.
2. You lock or unlock your wood door.
3. You burn wood as kindling or in a fire place.
4. You invariably use wood stairways.
5. You read a newspaper made from wood.
6. You sit at a wood table or desk on a wood chair.
7. You rest in easy chairs constructed from wood.
8. You use a wood pencil.
9. You use a match made of wood.
10. You smoke a wood pipe.
11. You glance at pictures in wood frames.
12. You wear rayon socks, ties, shirts, etc.; they are made with wood.
13. Cigarets, confectionery, and other food products are now wrapped in cellophane, made from wood.
14. The records you use on your phonograph contain wood flour.
15. Certain parts of your radio, also your auto and your aeroplane propellers (if you own one) are made of wood.
16. The linoleum in your home is made with wood flour.
17. In your coal-mine, wood props are vital in mining it.
18. A great deal of the twine you now use is made from paper. Similarly upholstery webbing in your arm chair is made from twisted paper twine.
19. Railway cars are constructed with wood in one form or another.
20. The modern ocean steamer contains more wood than the frigate of Nelson's day.
21. Plywood and veneers and the many composition boards with their thousands of uses are made from wood.
22. The modern steel skyscraper uses more wood during construction than the buildings constructed before the inception of the steel structure.
23. Wood boxes and cases are used for packing of almost every commodity existing.

**Think it over: Is there any other well known commodity which can compare in general usefulness with wood? What are you doing to foster its use?**

# *WOOD for TODAY*

By Ray C. Du Brucq

WOOD usage the world over is traditional and has become so much a part of our daily living that we would be a lost humanity without it!

Many materials have been developed to substitute for wood, but none meet the full replacement because each substitute lacks one or more of the virtues man wants.

**Wood is Warm—Friendly—Inviting**
**Wood is Beautiful—Durable—Economical**
**Wood is Available—Adaptable—Machinable—**
**Substitutes are not Comparable!**

Nature in its greatest beauty supplies our wood. Our forests, through continual conservation usage with scientific replacement, can and must be perpetuated. Wood can be planted and grown to maintain its supply. Wood must not be wasted. Its functions are unlimited. We sleep on it - walk on it - eat on it and with it - we are sheltered by it. It is the only material that is everywhere about us. We use it as an insurance against bad luck by "touching" it because it is always within reach. Wood is always ready to preserve life and property when an emergency arises. Many recent incidents have proved this.

The recent atomic attack tests proves it. Wooden structures were the least damaged because they were more resistant. Much has been written on this to show its value as a life saver.

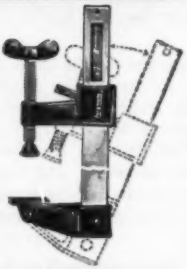
During the last Inauguration Week, wood relieved a serious transportation problem when the gapping Washington Union Station floor was repaired and in use again after very few hours of "smart" wood usage. Visitors were dumbfounded when, after so short a time, they could not see the scars of the wreck. Wood, although it burns well, has proved to be a fire resistor. Wooden beams and trusses burn slowly, do not buckle and collapse as readily as other materials causing complete destruction as was recently the case in a large industrial fire. Fire fighters would have been able to save costly equipment had the building construction held up. Wood is a poor heat conductor—a quality that saved many important papers in wooden files and desks, while all papers in steel files and desks were mere ashes, after an intensely hot fire in Chicago several years ago. All the desks were ruined but the heat did not get through the wood sufficiently to destroy the papers.

Wood floats—many have been thankful for them. The armed forces have developed many emergency uses for wood as well as many permanent uses. Realizing its many superior qualities, research continues and each day developments appear. From emergency hut and bridge construction plans, to permanent, wide spanning structures

Mr. DuBrucq is with the Rockwell Manufacturing Company.

**Bar Clamps with *hinged foot* . . . swing to and from work.**

Mount on any flat surface . . . bench, saw horse, etc., to make instant acting clamping jigs or fixtures. Ideal for repeat operations. Clamps are fixed, always available when needed—but swing out of way when not in use. Also usable as regular bar clamp.



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**ADJUSTABLE CLAMP CO.**

**418 No. Ashland Ave. • Chicago 22, Illinois.**

that are found more durable as well as more economical.

Wood in the home is a "must." Our furniture will continue to be made of wood—some inroads, it is true, have been made—mere fads, presenting a cold, stiff and uninviting appearance. Wood is God's gift to man for his comfort! Wooden floors are here to stay. They are resilient, easy on the feet. They help to keep the home drier and warmer. No floor is as beautiful as a properly laid wood floor. Wood has more insulation value for home construction than any substitute material used. Wood walls need not be as thick as other materials, permitting more floor space. Wood is more sound proof. Wood will not sweat or rust. Wood properly fabricated is stronger than equal weights in other materials. There is no monotony to wood—each grain struc-

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60% to 80% saving on sandcloth in sanding irregular shapes has been reported by many plants using a PEARSON MODEL A SANDER. Other cost saving features include sanding one or more stepdowns at same time, saving several costly operations; sanding of inside radii of circles and very flat tapered moulding. It is one of the fastest and most efficient sanders for irregular shapes on the market today! With the Pearson Belt attachment this model can be converted to an all-purpose sander at a small additional cost.

**SAVES 1 or 2 OPERATIONS**

Standard equipment includes 7 metal heads and 14 cushions made of the finest grade rubber. Length of cushions range from ¾ to 4 inches; outside diameters, 3¼ to 7 inches.

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HUNDREDS OF SATISFIED USERS of our Sanding Machines are an indication of the outstanding quality of our equipment. You too can save time and money by turning to PEARSON!

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**HIGH POINT, N. C.**


ture is individual and when properly brought out its beauty cannot be imitated by man or other material. Wood conserves critical materials and serves as well in most cases. Wood must never be permitted to become critical. And only through man's carelessness can it become so.

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**ENJOY WOOD**
**CONSERVE WOOD**
**BOOST WOOD**

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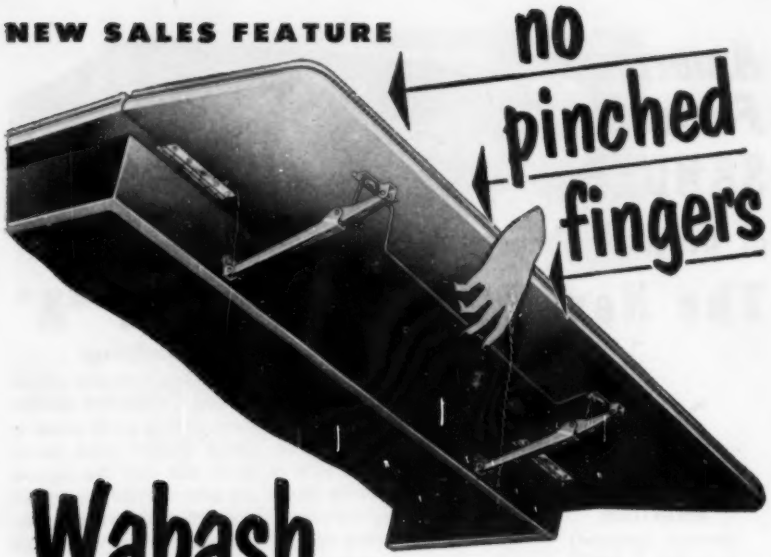
A new 52-page technical manual comprehensively covering all elements of V-belt drives, complete with tables, graphs and diagrams is being offered by the Boston Woven Hose & Rubber Co., Boston, Mass.

The V-belt manual has been compiled as much for maintenance supervisors, mechanics, purchasing agents, and students, as for the graduate engineer group. Languge is simple, clear and concise while the text is remarkably free of company product plugs.

NEW SALES FEATURE

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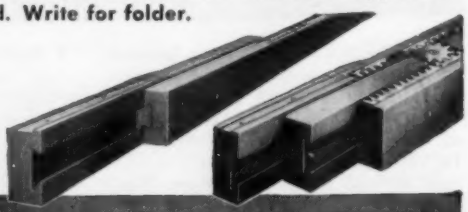

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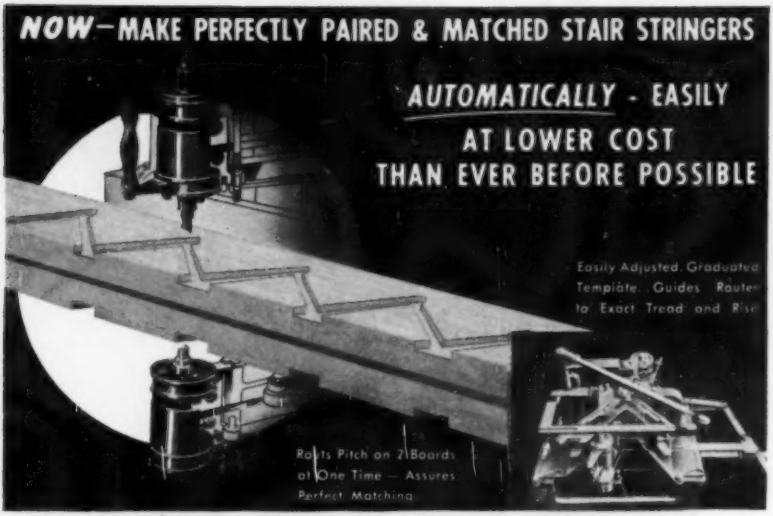
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**SUPREME WOODWORKING MACHINERY COMPANY**

**50-52 HOWARD STREET • NEW YORK 13, NEW YORK**

# Wood Working Panel

**Russell C. DECKERT**

WOOD WORKING Panel, a service for readers of Wood Working Digest, is conducted by Russell C. Deckert, industry service representative, at the State University of New York College of Forestry at Syracuse.

The purpose of this feature is to answer readers' questions regarding the use of wood in wood industry. It is hoped that other industries with similar problems will benefit by reading the questions and answers.

Questions should be sent directly to Wood Working Digest, 222 East Willow Ave., Wheaton, Illinois.

***1. We are experiencing some difficulty in the kiln drying of teak and ebony. Can you give us drying schedules for these two woods? We are using the material in the manufacture of furniture. (E. H., N.Y.)***

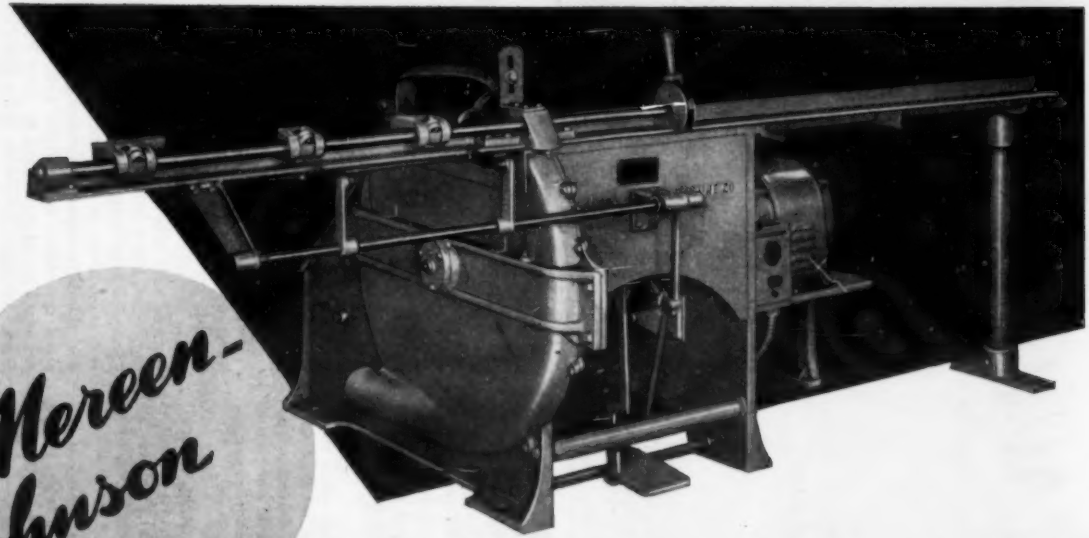
Teak is not a particularly difficult wood to kiln dry. However, ebony is another matter. Ebony is a rather refractory wood and the heartwood often develops long, fine and deep cracks.

Mr. Raymond C. Rietz, Chief of the Division of Timber Physics at the Forest Products Laboratory, Madison, Wisconsin, has the following suggestions to offer: "It is recommended that schedule T5-C4, as found in the "Forest Products Laboratory Report No. 1791," be used. If the stock is partially air-dried, it may be well to run one day on schedule T5-4A, and then switch to the appropriate step of T5-C4 based on the moisture content of the stock at that time. Should you be pressed for kiln time when you run your next charge of teak, it is recommened that you place the stock on the steps in T5-C4 based on its moisture content, eliminating the one-day run on T5-A4.

"In the drying of ebony it is recommended that you try kiln schedule T3-B2. The initial drying conditions would be based on the moisture content of the material at the time that it was put into the kiln. It will not be necessary to place the kiln charge on the "A" humidity schedule prior to placing it on the "B" schedule, even though it has been air-dried at the time you get the material."

***2. Will you kindly send me information about the manufacture of cigar boxes, specifically naming the species of wood used by New York manufacturers? (E.R., N.Y.)***

Wood used for cigar boxes should have a pleasing aroma, be light in weight, have a fine uniform texture, and a straight pleasing grain, be easily worked, and relatively free from warping, checking and taste. Formerly Spanish cedar was the preferred wood. However, due to the increasing cost and the difficulties in obtaining the desired quantities of Spanish cedar, the principal wood now used in New York State for cigar boxes is Sitka spruce. Other woods used for this purpose in



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***The greater your production . . .***
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- Ideal for any production cross-cutting operation.
- Fewer machines save floor space, power, labor

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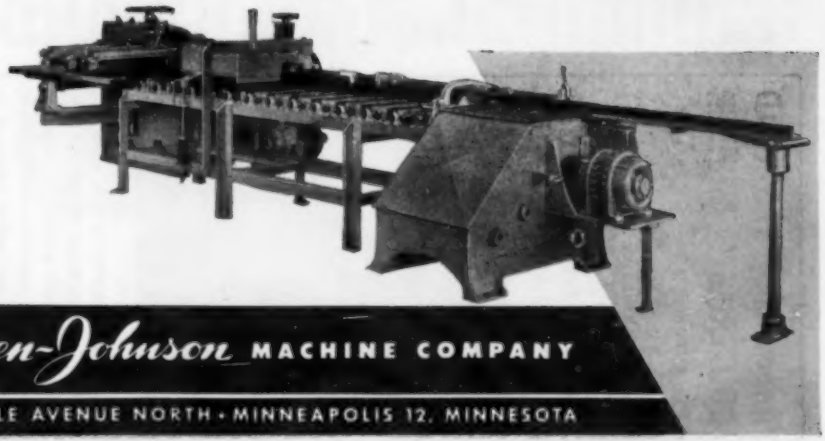
- Fewer machines save floor space, power, labor
- Includes new retracting stock support

**THESE MACHINES** have a capacity equal to two or three swing, straight line or roller carriage cut-off saws—depending on the condition of the stock. They are particularly efficient wherever short lengths are cut from long boards in quantity production. Two saws, mounted opposite from each other on a revolving yoke, make alternate cuts. Each saw disappears beneath the table as it cuts. The operator never has to wait for the saw to return to the back position, as is the case with an ordinary reciprocating type of machine. The stop lever at the operator's left hand leaves the right hand free to handle the stock. *Available in two models: No. 477, 17" wide. No. 478, 23½" wide.*

### COMBINATION UNIT

Automatic cut-off saw, gang rip saw and automatic hopper feed for gang rip saw. The stock leaving the cut-off saw drops onto the bed of the automatic feeder. This in turn feeds into the rip saw—eliminating the off bearer of the cut-off saw and feeder of the gang rip saw. Note the saving of two men in this operation.



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the state are redwood, basswood, red gum and mahogany. Basswood is made to look like Spanish cedar by passing thin sheets of veneer between rollers having minute teeth by which the wood is indented, so that it has the appearance and characteristics of Spanish cedar. The wood is also stained a cedar color and sometimes the odor is artificially obtained by treating the wood with a decoction of cedar shavings and sawdust.

Professor Raymond J. Hoyle, Head of the Department of Forest Utilization, State University of New York College of Forestry, states that most of the large cigar box manufacturers in the state are located in the New York City area. The thin stock used for cigar boxes is either sawed from logs or cut into veneer, depending upon the mill facilities and species. Veneers 5/32 of an inch and 3/16 of an inch are the two most common sizes used for cigar box stock, the thicker sizes being for sides and ends. Thicknesses of ⅛" and 1/7" also are quite common. The value of cheaper woods could be increased considerably by covering one face with a paper-like thickness of Spanish cedar veneer. 1,000 surface feet of cigar box stock will make approximately 560 average cigar boxes. The industry does not have standard sizes of boxes. This lack of standardization causes most boxes to be made to order. New, automatic cigar box machinery has been in use by a few concerns but it is felt by some that it will not be used widely unless box sizes are standardized. Tin containers, cardboard boxes, and small cardboard packages are used by some manufacturers. However, the industry believes that the wooden cigar box will never be completely replaced.

***3. Is there any justification for local building codes and insurance companies discriminating against the use of wood shingles as a roofing material? (K.D., Pa.)***

This question has been asked many times, and the truth of the matter is that in cities that have no prohibitive regulation against the use of wood shingles, fire losses are as great as in those cities that actually prohibit the use of wood shingles.

The industry has unfortunately inherited a stigma from the past when poorly manufactured, thin, mixed grade shingles were used in large quantities. Such poorly manufactured shingles, badly cut, warped and split, were more of a fire hazard than some of the definitely fire-proof materials such as slate and asbestos. Therefore, many years ago ordinances crept into city codes prohibiting the use of shingles. However, these ordinances are being repealed gradually because of the superior quality of the present wood shingle. Actually, though wood shingles have a lower ignition point than mineral-coated asphalt shingles, they do not contribute as much fuel to a fire as do asphalt materials when once ignited.

At the present time approximately 95% of the shingles produced in the United States are cut from western red cedar. In 1931 the Bureau of Standards of the Department of Commerce established quality standards for the manufacture of wood shingles. The standard as revised is known as commercial standard 31-38 and covers the No. 1 grades of redwood and cyprus shingles. Approximately 85% to 90% of the shingles now manufactured conform to these standards and the grade marks of accepted associations and inspection agencies assure conformance to this standard.

Norfolk, Va.; Nashville, Tenn.; Birmingham, Ala. and San Antonio, Texas, repealed their anti-shingle ordinances within the past few years. On the other hand, such large cities as Detroit, Michigan; Los Angeles, Cal.; Houston, Texas and Seattle, Wash., and many others

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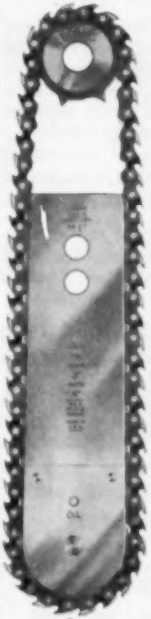

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have never had restrictions against the use of wood shingles on roofs.

The insurance companies in setting up their rates were somewhat influenced by these ordinances and have not seriously re-examined the factors involved.

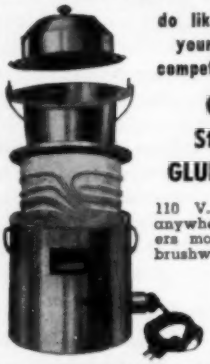
In many states there is a differential in insurance rates, but this differential is so small that it seldom influences a home builder. It is my belief that a wood-shingled roof has a life perhaps twice as long as some of the competing materials, and so the small differential is seldom a factor in the selection of roofing material.

There is apparently little that can be done to rectify this apparent discrimination except to wait until time demonstrates the injustice of this situation.

***4. In the November column you had an inquiry dealing with blue stain in white oak veneer. We are quite familar with this stain, but we always thought it was caused by the knife blade on the veneer slicer. The remedy for this stain has always been an application of oxalic acid before drying. How does this treatment differ with your recommendation of a 5% solution of sodium pentachlorophenate? (E.M.B., Pa.)***

The question and answer that appeared in the November issue of the WOOD WORKING DIGEST concerned blue stain that was caused by a fungus. The stain that you refer to is known as a chemical stain, and in oak it is due to the contact of moist veneer with iron or steel and is an entirely different problem. The chemical reaction that occurs between the tannic acid in the oak and the iron is similar to the reaction in the manufacture of writing ink. The reaction goes on only in the presence of moisture. It may develop in oak logs


**If You Melt Glue . . .**



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that are stored under water in steel tanks or it may develop from the contact of the wood with the lathe knife or nosebar or other metal parts on the lathe. It may also develop at any point where the green veneer comes in contact with iron as at the clipper or at the green end of the veneer dryer. Once the veneer has been dried to a moisture content in equilibrium with normal room conditions, there is no longer much danger of iron stain unless both the metal and water are present.

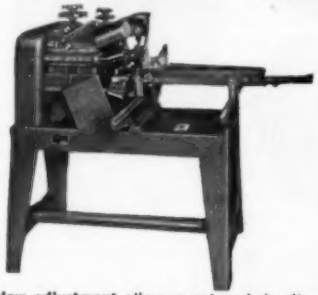
H. O. Fleischer at the Forest Products Laboratory in Madison, Wisconsin, has the following suggestions to offer: "Relative to the control measures for chemical stain in oak veneer, wooden tanks instead of steel tanks may be used for heating oak logs, or, if steel tanks are used, the logs may be heated in steam instead of water. On the lathe or slicer, the stain does not usually develop unless the cutting is stopped while the wood is in contact with the knife or nosebar, or the veneer rests for an appreciable time on a metal part of the lathe. The same applies to the clipper. Some manufacturers of oak veneer have equipped the green end of the veneer dryer with brass-covered rollers instead of the usual iron rollers in order that stain may not develop at this point."

Chemical stains of the type you describe can be removed by the application of an oxalic acid bleach treatment. However, this is not a preventative measure and will not remove blue stain occuring because of the presence of a fungus.

Some companies apply an alkaline solution to the wood to reduce chemical stain. A solution of soda using 1½ pounds of sodium carbonate to 50 gallons of water may be used for this purpose.


**HARRIS**

**DELUXE FLOOR MODEL TENONER**



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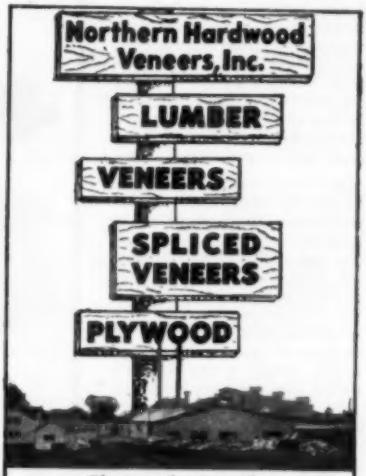


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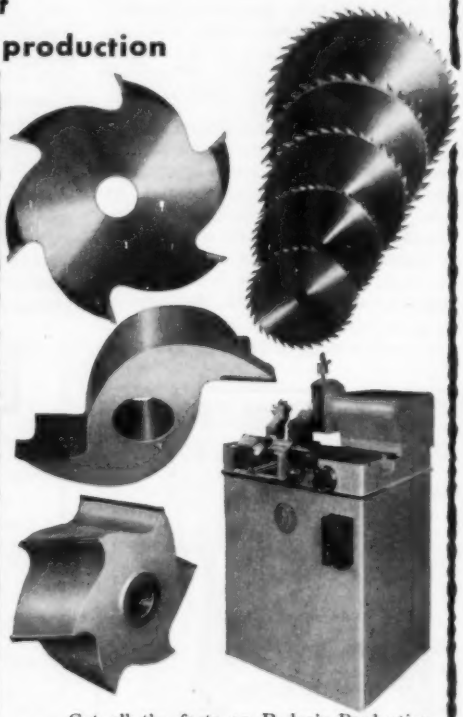

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# The Carbide Story

CAN I use carbide tooling on my product? Is my machinery qualified for carbide tools? What is the advantage over high speed steel? Can it be jointed? Do I need special cutter heads? Who is going to grind it?

These and many other questions are asked by those who begin to think of using carbide tooling on their machines. Carbide woodworking tools can and will be successful in most applications where high speed steel is now used. The manufacturers of carbide woodworking tools need only your cooperation and honest attempts to bring about this goal of increased production through the use of carbide tooling. If carbide tools have become successful in the machining of plastics and wood substitutes, they can be equally successful in regular woodworking.

The reason the fabricators of wood substitutes have come nearer to their goal is because they had to experiment with better methods of machining their products or fall by the wayside. No, they did not all rush out and buy new machinery. They reconditioned their machines, revised their patterns, read up on carbide, then bought a carbide tipped tool of some sort. Invariably it did not work and many shops have that high priced carbide tipped cutter hanging somewhere in their shops—not as a momento of failure, but as one of attempt. You will also notice that they are now doing that tough job with carbide.

Who should stand the cost of those cutters that failed? Oh, no, you don't. We all share in that experimental cost. First, the manufacturer of the carbide has to compound the ingredients, make new dies, employ expensive furnaces and presses and then in many instances, sell the tip to a fabricator at a loss. The fabricator then has to design and make a cutter, braze on a tip, grind the tip with a diamond wheel and then sell the cutter to a woodworker, invariably at a loss. If the cutter is successful at first, who got stuck with the bill? Don't forget that the cutter can last up to 100 times longer than the regular cutter. If it does not work out, who lost? All three. If we were to stop here, everybody loses! Now let's be sensible about this.

You, the user, could say to the fabricator, "I would like to try another cutter, but this time I'll change my pattern slightly and I think it would be better if you furnished a new cutter with less hook angle."

The new order goes to the fabricator's engineers and in their study (and they really do study a replacement job) they will say, "With the change that the customer wants, we can heavy up the body of this cutter and increase the included angle of the carbide making it stronger."

So far we have four new developments. The fabricator then talks over the revised problem with the carbide manufacturer and he will notice that, if the carbide does not have to come to such a sharp angle, he can furnish a longer wearing tip. If this becomes popular, he can reduce the cost of these tips. There you have five new developments and a price reduction because

the three did not give up the first time. Such a research development by a laboratory would cost thousands of dollars, many months of time, and probably would not come out as good for your problem.

Would carbide be worthwhile in my shop? Definitely if you as much as saw a piece of wood or wood substitute, you can use carbide tooling to advantage. For example, Joe had a small shop in his back yard, employing only his son. He had a small shaper, saw, jointer, drill press and the usual hand tools. His business was to make kitchen cabinets for the local carpenters. His shop would probably give him an income of $200 a week, before taxes.

"My gosh, that carbide tipped saw that the salesman tried to sell me cost me a week's wages," lamented Joe.

"But wait, Joe you make a good kitchen cabinet don't you? Don't you joint all these parts before assembly? Don't you cut lip cupboard doors and drawer joints on your cabinets? In a week's time, Joe, don't you run your jointer at least two hours? Don't you sharpen your saw at least once? Filing a saw and replacing one takes an hour doesn't it? If you could sharpen your shaper cutter, it would take an hour to sharpen and replace it, wouldn't it? Well then, if your week is worth $200 for you and your son, that four hours you're wasting is worth $8 per week. The carbide tip tools should last for six months and that is worth $208 and you still have your carbide tipped tools. The sharpening of these two tools isn't more than the purchase price of two regular tools and you have also improved your product.

"In the next six months, you can save nearly $200 more. This represents your earnings in tooling alone. Now add this to the production gained by your shaper and saw not being down for sharpening and you have gained another four hours a week and at your rate of $2 per hour, you have another $208 gained in the first six months. In your little two man shop, Joe, you can, by spending $200, plus the cost of sharpening, gain $832 per year and a better product. This is $832 that can be used for advancement of your shop and a fine vacation."

However, let us be more broadminded than Joe. Let's not be frightened by the initial cost of carbide tooling, but take a broad viewpoint on this product improving and money saving idea.

The formula for the study of the advantage of carbide tooling is quite simple. You may just take the initial cost of the tooling, plus the down time, plus the sharpening time and total these and compare them with the cost of the carbide tools. Doesn't it seem strange that in the cases where carbide becomes really necessary the high cost of carbide seems to be very small because the product cannot be manufactured with anything but carbide? Yet, when the woodworker thinks of using tungsten carbide on his ordinary materials, he shudders to think of the high cost of tooling.

Tungsten carbide has been successfully applied to all kinds of cutter heads, including the tungsten carbide used in thin knives. It is a known fact that carbide is successfully being applied to saws. Inlaid carbide knives have become a reality. Many plants have been using tungsten carbide tipped milled-to-pattern bits for many years. In actual cases tungsten carbide has been applied to practically any operation that has been successfully done with high speed steel.

One of the greatest problems in the utilization of tungsten carbide tipped tools was the impossibility for grinding service. Some of the woodworking machinery manufacturers have realized

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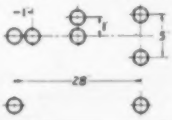


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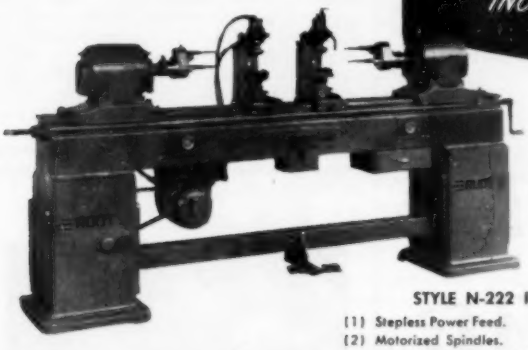

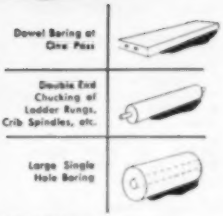


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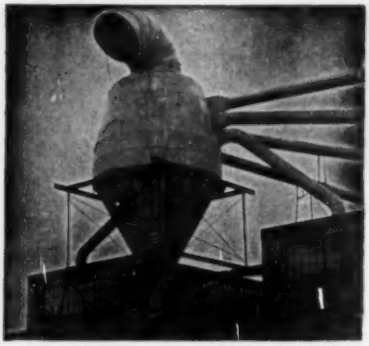

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the possibilities in the use of tungsten carbide tools and have designed and manufactured some very excellent carbide sharpening machinery.

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### SAWDUST BURNERS

Bulletin No. 37 is available from the Rees Blow Pipe Mfg. Co., 340 Seventh St., San Francisco, Calif. The brochure illustrates both single and double wall burners. Rees double wall burners are designed for fast and safe burning of sawdust and shavings. They are especially made for remanufacturing plants with daily capacity—eight hour shift—of from 25,000 to 400,000 board feet.

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SECTION

# FORMULAS For Popular Finishes

**By Ned Bailey**

LET me make it clear that these are only "suggested" finishing formulas that have been found quite satisfactory in actual use. These formulas are open to considerable variation, and I would prefer that they be regarded as typical rather than standard procedures. They are designed to meet the requirements in commercial use on wood radio and TV sets, furniture and other wood products to which such finishes would usually be applied. Although there are many instances where product production will permit hand finishing profitably, schedules for finishing in this era of mass production have outmoded most of the old methods.

Here we will consider mass production finishing methods as being more generally used. May we again call to your attention the services available to you from the manufacturers of both finishing materials and equipment? Most of these companies maintain highly skilled specialists and experimental laboratories. They are eager to help you and their experience and knowledge should be of great value to you, not only in your color styling problems, but in development of your mass production methods.

As we are well aware, wood texture and color differs greatly in different species as well as within each species. Therefore, the colors desired in the final finish determine such things as the choice of stains, toners, and fillers, as well as which procedure to follow in procuring this color and finish. Another element affected is drying time. This is determined by the different requirements of the materials used to get the best results.

### Mahogany

A very popular finish is mahogany. It is applied to many woods that are good looking in their own right when finished properly. However, mahogany finish is often applied to the following: birch, maple, magnolia, cherry, poplar and tupelo. The finish described can, in fact, be used on many other light colored, close-grained woods to get satisfactory mahogany finishes.

Mahogany pigment wiping stain is used as a spray, dip, or can be brushed

on. The piece should then be wiped and blended out, then spray-shade with a solution of the same stain that has been reduced about 400%. Either air-dry overnight, or force-dry about 2 hours at 125 degrees F. and a relative humidity of from 25% to 40%. Then spray on a lacquer sealer and air-dry from 1 to 4 hours or force-dry 30 minutes at 130 degrees F. and 35% relative humidity; and sand. Spray on one coat of flat varnish and air-dry over night. Then rub to get the desired finish.

When the wood is not of uniform color and a mahogany finish is to be produced, use a mahogany lacquer toner, spraying it on. Air-dry the piece about 1 to 4 hours, or force-dry about half an hour at 130 degrees F. and 35% relative humidity, then sand. Next spray, dip or brush on mahogany pigment wiping stain, wipe then blend out. Air-dry overnight or force-dry 2 hours at 125 degrees F. and between 25% and 40% relative humidity. Spray on lacquer sealer, then air-dry 1 to 4 hours, or force-dry 30 minutes at 130 degrees F. and 35% relative humidity, then sand again. One coat of flat varnish should then be sprayed on, and again it must be air-dried overnight, then rubbed to desired finish.

Red or brown mahogany finish on mahogany wood. A mahogany non-grain-raising body stain is sprayed on and air-dried for 20 minutes. A wash coat is next sprayed on, then air-dried for 30 minutes and sanded. Mahogany filler is sprayed on, wiped and cleaned up. An overnight air-drying, or force-drying for 90 minutes at 130 degrees F. and 35% relative humidity, is followed by a cooling period.

Lacquer sealer or shellac is sprayed on and either air-dried for from 1 to 4 hours or force-dried 30 minutes at 130 degrees F. and 35% relative humidity and sanded. Mahogany glazing stain is either sprayed or brushed on, wiped and blended out. Air-drying or force-drying for from 1 to 2 hours at 130 degrees F. and 35% relative humidity follows. If the glazing stain is omitted, use lacquer shading stain to obtain a uniform color, air-drying same for 10 minutes.

A coat of gloss lacquer is sprayed on and air-dried for 2 hours, or force-dried for from 30 to 60 minutes at 130 degrees F. and 35% relative humidity. The piece should then be sanded lightly. One coat of flat lacquer should then be sprayed on, followed either by overnight air-drying, or force-drying for 90 minutes at 125 degrees F. and 35% relative humidity. Finally rub dull.

**Modern Mahogany Finishes**

Going modern, we suggest the following schedule for toasted mahogany, Swedish modern, or "Harvest" on mahogany wood. Spray or brush on the bleach first on light colored woods. However, unless an extremely light colored finish is desired, the bleaching operation is not required. When bleaching is done, it is necessary to air-dry 48 hours, or force-dry 15 hours at 125 degrees F. Under certain conditions, forced-drying schedules can be reduced as low as 4 hours at the same temperature. Experiment will give the answer to this time element.

After bleaching, the piece should be sanded. A wash coat that is tinted slightly is next sprayed on and the piece air-dried for 30 minutes, then sanded.

A light amber filler should then be sprayed on and the piece wiped and cleaned up, then either air-dried overnight, or force-dried 90 minutes at 130 degrees F. and 35% relative humidity and cooled. Next spray on a lacquer sealer, force-dry 30 minutes at 130 degrees F. and 35% relative humidity, and sand. To this apply one coat gloss lac-

quer, air-dry 2 hours, or force-dry 30 to 60 minutes at 125 degrees F. and 35% relative humidity, and sand very lightly. Now one coat of flat lacquer, force-drying 90 minutes at 125 degrees F. and 35% relative humidity. Finish by rubbing.

When wood other than mahogany is not of uniform color, but is to have mahogany finish, follow the same schedule as described for walnut finish on similar type wood. In this mahogany schedule, however, use mahogany toner and wiping stain instead of walnut.

**Walnut**

Walnut finish is very popular, too, not only on real walnut, but on several other species. We will first describe walnut finish on walnut wood, where the all-important drying is either by air-drying, or on a force-drying schedule.

The first liquid applied is a non-grain-raising sap stain, and then a walnut non-grain-raising body stain is sprayed on. The piece is then air-dried for 20 minutes. A wash coat is then sprayed on, and the piece again air-dried, this time for 30 minutes, after which it is sanded. Walnut filler is sprayed on, then it is wiped and cleaned up. Overnight air-drying or force-drying is done for 90 minutes at 130 degrees F. and 35% relative humidity. The piece is then allowed to cool.

Walnut glazing stain is then either sprayed or brushed on. This is followed by wiping and blending out. Air-dry overnight, or force-dry for a couple of hours at 130 degrees F. and 35% relative humidity. A coat of gloss lacquer is sprayed on and the piece is either air-dried 2 hours, or force-dried from 30 to 60 minutes at 125 degrees F. and 35% relative humidity. Then sand the piece lightly. One coat flat lacquer is next sprayed on and air-dried overnight or force-dried 90 minutes at 125 degrees F. and 35% relative humidity. Rub to a dull finish.

When walnut finish is applied to walnut wood on what is generally considered volume production, force-drying and continuous conveyor equipment is used. First, non-grain-raising walnut sap stain is applied, thin walnut non-grain-raising body stain is sprayed on. Air drying for 20 minutes follows. A wash coat is then sprayed on, followed by another 30 minute air-drying and sanding. Walnut filler is next sprayed on, wiped and cleaned up. Force-drying now begins and continues for 90 minutes at 130 degrees F. and 35% relative humidity, and the piece is then cooled off.

After a lacquer sealer has been sprayed on, another force-drying takes place, lasting 30 minutes at 130 degrees F. and 35% relative humidity. The piece is then sanded. Lacquer shading stain is sprayed on and routing stain brushed on. If there are any decorations, they are applied at this time. Then comes a 10 minute air-drying period.

Now comes a coat of high-sheen flat

"I'M AFRAID BURPING THE DOLLS WON'T GET RID OF OUR AIR BUBBLE TROUBLE, HOMER!"

urea-alkyd finish, sprayed on. Next, set up at room temperature for 10 minutes. Force-dry for 90 to 120 minutes at 150 degrees F. and 35% relative humidity. Then cool to room temperature. Finally rub to a high sheen, but do not polish.

The foregoing schedule can be shortened by eliminating the wash coat and limiting shading, routing and other decorations. Then in place of using high sheen flat urea-alkyd finish, use one coat gloss or flat varnish, air-drying the piece overnight. Follow this by rubbing dull or rub and polish.

Walnut finish on cherry, maple, birch, poplar, tupelo, magnolia, or other close grain woods where the wood is uniform and light colored should follow a schedule like this: First apply walnut pigment wiping stain by either brushing, dipping or spraying. Next wipe, blend out and shade, using the spray with the same stain reduced about 400%. Air-dry the piece overnight, or force-dry it for 2 hours at 125 degrees F. and 25% to 40% relative humidity.

Lacquer sealer is next sprayed on, then air-drying takes 1 to 4 hours, or it can be force-dried half an hour at 130 degrees F. and 35% relative humidity. Sanding follows. One coat of flat varnish is sprayed on and the piece air-dried overnight. The piece is then rubbed.

**Maple**

When red, or brown maple finish is to be obtained on white pine, poplar, tupelo, birch, or maple, start with a non-grain-raising maple stain sprayed on, and air-dried for 20 minutes. Spray on a lacquer sealer and force-dry 30 minutes at 130 degrees F. and 35% relative humidity, and sand. Now use maple glazing stain applying it with either brush or spray. Wipe this and blend it out and either air-dry it overnight or force-dry 1 to 2 hours at 130 degrees F. and 35% relative humidity. The final finish on this piece should be one or two coats of lacquer, one coat of urea-alkyd finish, or one coat of flat varnish, preferably sprayed on, then rubbed.

The foregoing schedule can be shortened, if the finished product warrants, to a maple colored sealer sprayed on and air-dried from 1 to 4 hours or force-dried 30 minutes at 130 degrees F. and 35% relative humidity, and sanded, and one coat of flat varnish sprayed on this and air-dried overnight.

To procure a so-called natural maple finish on maple, spray on a lacquer sealer, and air-dry up to 4 hours or force-dry 30 minutes at 130 degrees F. and 35% relative humidity, then sand. Spray one coat of gloss lacquer and air-dry 2 hours, or force-dry 30 to 60 minutes at 125 degrees F. and 35% relative humidity, and sand lightly. Spray one coat flat lacquer and force-dry an hour and a half at 125 degrees F. and 35% relative humidity, or air-dry overnight. Rub with steel wool and wax.

**Oak**

For lime oak finish on either oak or ash, start with a lime oak toner, spraying it on, and then air-dry for 1 hour and sand. Follow this with a lime oak or white filler which can either be brushed or sprayed on. Wipe this and clean it up carefully. Air-dry overnight, or force-dry 90 minutes at 130 degrees F. and 35% relative humidity. When cooled off spray on lacquer sealer, air-dry for 1 hour and sand. Follow with one coat of flat lacquer, one coat flat urea-alkyd finish, or one coat high-sheen flat varnish, then rub.

"Swedish" oak finish is obtained by using a light amber non-grain-raising stain which should be sprayed on, and air-dry for 20 minutes, and spray on the wash coat. Air-dry for about 30 minutes and sand. Brush or spray on "Swedish-oak" filler, wipe and clean

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up, and either air-dry overnight, or force-dry 90 minutes at 130 degrees F. and 35% relative humidity. After cooling, spray on lacquer sealer and force-dry 30 minutes at 130 degrees F. and 35% relative humidity and sand. Add one coat of flat varnish by spraying. Air-dry overnight and rub. Should you care to shorten this schedule in keeping with product to be finished, omit the first application—the light amber non-grain-raising stain—and the second step, the wash coat.

**Cedar**

For natural cedar finish on cedar wood, so popular in the mid-south, spray reddish amber non-grain-raising sap stain and air-dry 20 minutes. If a finish of more uniform color is required, apply again to sap streaks. Pure white shellac should be sprayed on next. To get a shellac of proper consistency for this purpose, prepare as follows: 2 parts 4½ lb. cut shellac, 2 parts alcohol, 1 part mixing lacquer. Air-dry 4 hours or force-dry 45 minutes at 120 degrees F. and 25% to 35% relative humidity, then sand. Next spray one or two coats lacquer or urea-alkyd finish and air-dry or force-dry to suit conditions. Finally rub and polish, or use steel wool and wax.

**Blond Finishes**

The recent summer Home Furnishings Market in Chicago showed a slight decline in the very light colored finishes. There were many subtle color variations in the medium tones. Some of the so-called blond finishes had a pinkish cast, some were smoke-gray, while others had warm brown tones.

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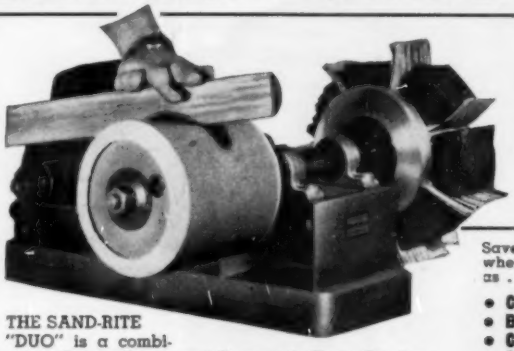

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maple, combined with light walnut and mahogany colors.

The blond finishes are used on many kinds of wood, either naturally light or bleached. In addition to those mentioned in the previous paragraph are birch and beech, all of which are light enough without bleaching. However, both walnut and mahogany must be bleached. In any case, either a wash coat colored very slightly, or a very light amber non-grain-raising stain may be applied. Where a wood has open pores, it should be filled with a natural or a very light brown filler. Then a lacquer sealer coat should be followed by water-white lacquer, varnish, or a synthetic finish to complete the job. There are occasions when a small amount of white lacquer enamel may be added to the wash coat, together with a little raw sienna in oil. This application will maintain a light color without hiding the grain of the wood to any extent.

**Conclusion**

I do not want to leave this article without acknowledging the fact that finishing procedures and equipment are a complex problem and highly individual. They require much more thought and foresight than they are often given. The schedules suggested here are adaptable to finishing on a continuous conveyor. In view of this fact, it must be borne in mind that for both economical and efficient conveyor finishing, it is necessary to force-dry the fillers and final coats. Furthermore, for the best speed, the stain, wash coat, glazing stain and sealer should also be force-dried, particularly the sealer coat.

To evolve the most effective conveyor schedule, three people should go into conference, the manufacturer, the conveyor designer, and the manufacturers of the finishing materials. And these three should give considera-

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# Causes of . . .
# CIRCULAR SAW ACCIDENTS

**By Dan Adair**

**This study follows our two-part article on "Preventing Circular Saw Accidents." The two articles complement one another very well. How does your plant conform to the state safety code?**

AN analysis of 644 circular saw accidents happening in 13 different states shows that 70% of them were to workers who feed material into the saws, 68% involved bodily contact with the saw blade and 85% of all these accidents were to the fingers or hand. This article is a partial report of a study being made by the Bureau of Labor Statistics, United States Department of Labor in cooperation with a number of state labor departments. The entire study was set up to include approximately 1,200 cases drawn from not less than 12 states. It was felt that this number would insure a valid and representative analysis. It was felt by the International Association of Governmental Labor Officials that there is not now as much factual information about circular saw accidents available as was necessary to organize a program of preventing such accidents. This study is the result.

The collection of individual case reports, around which the study is built, was assigned to state safety inspectors. The tabulation and analysis of the data obtained is being tabulated by the Branch of Industrial Hazards, Bureau of Labor Statistics. Plans for the study included accidents involving all types of circular saws except saws of the portable variety and the large circular saws commonly used in sawmill operations.

While this article reports on only 644 of the approximately 1,200 cases to be studied, we have been informed that the trend throughout the entire study does not vary from the data presented here.

Now, let's take a look at chart No. 1. While we have always more or less assumed it to be the case, this study certainly proves that the vast majority of injuries are experienced by workmen while feeding materials into the saws.

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Mr. Adair is a staff representative in the Wood Products Section of the National Safety Council.

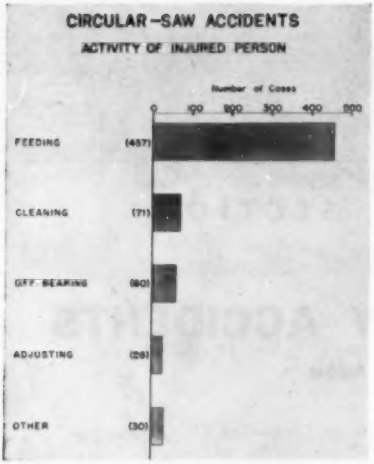


**Chart 1.**

Another thing that is especially significant about this chart is that 15% of the injuries occurred to workmen adjusting or cleaning their machines.

Chart No. 2 again shows what we have generally known to be true—that the great majority of circular saw accidents involve bodily contact with the saw blade. Likewise, kickbacks are a serious cause of accidents and 46 of the 51 accident types listed as "rubbed, abraded, penetrated" were caused by flying sawdust, wood chips or splinters, showing the necessity of wearing goggles and proper clothing.

Again in chart No. 3, we are not surprised to learn that most cuts, lacerations and amputations are to the finger and next to the hand or arm. The really striking thing about this chart is the high proportion of amputations—more than 1/5 of all the injuries reported were finger amputations.

Chart No. 4 shows the violations of state safety codes and relationship to the injuries studied. In connection with the code violations, it might be well to note here that most state codes are patterned after the "American Standard Safety Code for Woodworking Machinery." In connection with this chart, it is interesting to note that more than half of the total cases studied involved injuries sustained while working on hand-feed ripsaws and 226 of these injuries involved a code violation. Also, 133 cases involved hand-feed cross cut

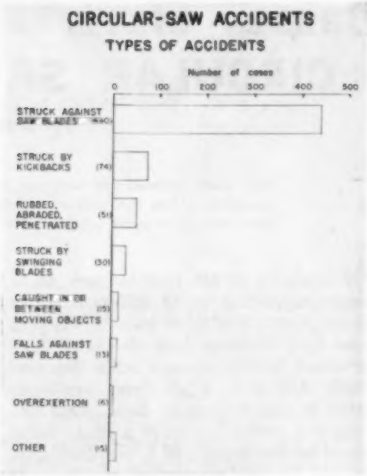


**Chart 2.**

saws with 74 violations being reported. It is also highly significant that out of the 644 cases studied, state safety code violations were involved in 377 of them.

It has been reported that an interesting sidelight that showed up in making the tabulation was the high number of cases in which necessary guards and safety devices were available, but at the time of the accident either were not in use or were improperly adjusted.

The lesson that we can all draw from this study is that we should see to it that our circular saw operations all conform to the requirements of the

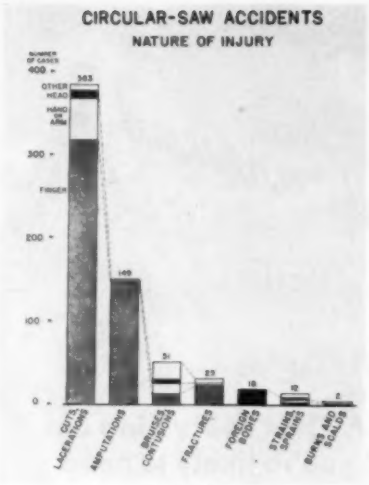


**Chart 3.**

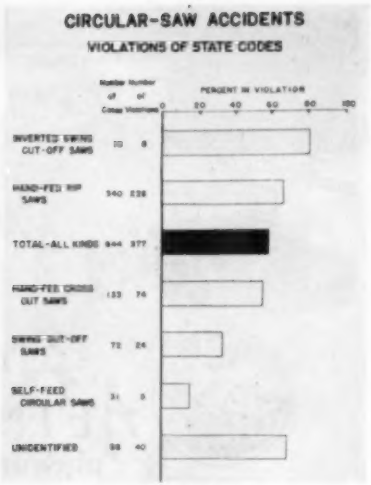


**Chart 4.**

"American Standard Safety Code for Woodworking Machinery" and we must insist more than we have in the past, on guards, anti-kickback dogs, other safety devices and proper protective clothing being worn at all times.

We sincerely hope that this study, when completed, will go into more detail in connection with the matters discussed here and help us throw more light on the subject of circular saw accidents.

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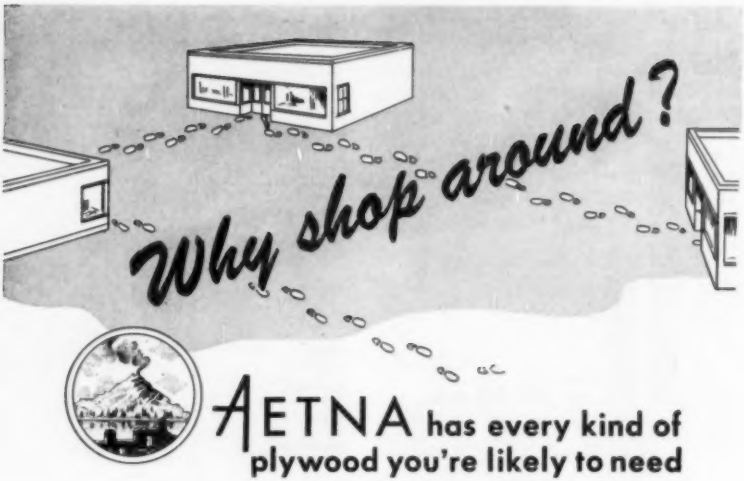




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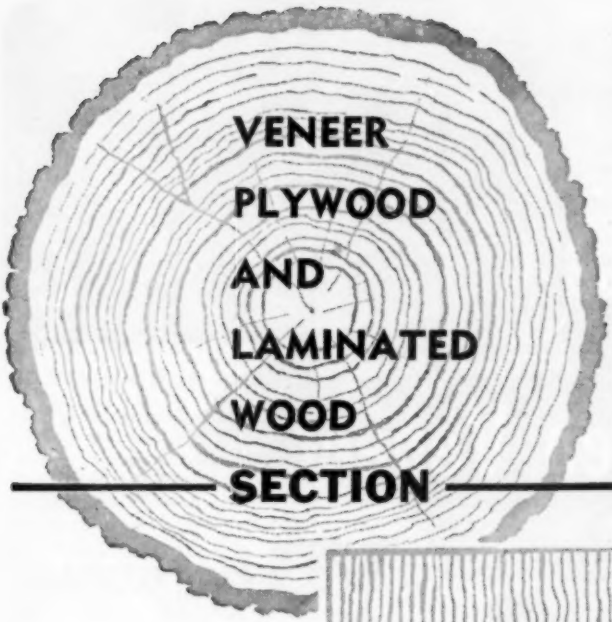


# VENEER PLYWOOD AND LAMINATED WOOD SECTION

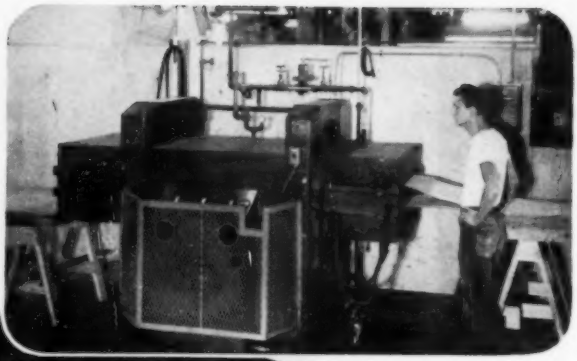
## *Features . . . .*

Veneer and Plywood Machinery
Part 10
*By Thomas D. Perry*

Technique for Bonding Metal-Faced Plywood
*By Jac Tigelaar*

**Photo at right**

courtesy of the Mengel Company, Louisville, Ky., illustrates a VB 38 x 100 - 2 opening press being used for flattening veneer.



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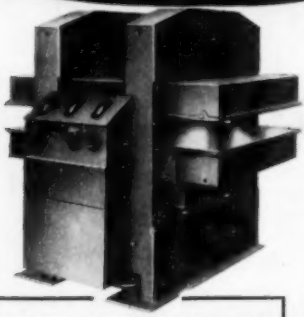

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## Planers for Lumber Core Stock

**By Thomas D. Perry**

THE previous several articles have described the principal types of machinery, which are available to dimension strips of lumber, to eliminate the normal wind, to joint the edges, and to glue and clamp them together into lumber core blanks.

There is an important intermediate step, between the release from the core clamps and the planing or surfacing, that must not be slighted. Liquid glue has been spread in all the edge joints and its solvent (usually water) has penetrated into the wood immediately adjacent to the joint, causing more or less swelling in thickness along every joint. This may have been largely evaporated when the resin adhesives have been cured by steam or electronic heat, or when the core blanks have been piled on stickers and the imbibed moisture allowed to equalize for several days. Unless this joint moisture is adequately provided for, there will be slight shrinkage at the joint after planing, and inevitable "sewers," that can only be observed after applying gloss finish coatings. This is illustrated in Fig. 1, showing cross sections of lumber core blanks at various stages, all of which are described in the captions. If this pre-drying is neglected, there is no way to correct it after the core blanks have been glued into plywood.

### How Many Planings are Necessary?

Three planings are essential to properly prepare a lumber core blank for gluing, as is illustrated in Fig. 2 and explained in the descriptive title. The first planing, A, takes off no more than enough to remove all irregularities and provide a clean smooth surface for inspection. This is to be the face side of the plywood. The second pass through the planer, B, reduces the core blank to nearly the desired thickness, allowing for a final "skin" cut, C, on the face. This final planing, C, is imperative for the best quality of figured face plywood.

The reasoning behind this three-fold technique is logical. It is an established fact that any properly made planer will produce the smoothest and flatest surface of which it is capable, when making a thin cut at relatively slow feed, providing the cutter knifes are sharp and well jointed. Conversely, no planer will do as high quality work on heavy cuts and fast feeds. It is almost inevitable that there will be some tearing of the grain, obvious cutting ridges, and "dubbed" corners, which are below standard thickness. If the face of the core blank gives evidence of mediocre workmanship, its shortcomings will inevitably be transmitted through to the face of the plywood.

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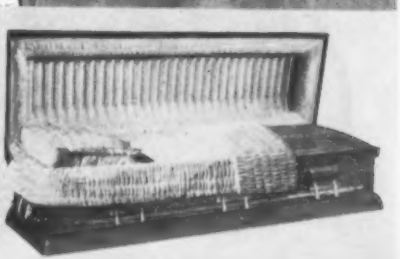

Don't hesitate to recommend it to
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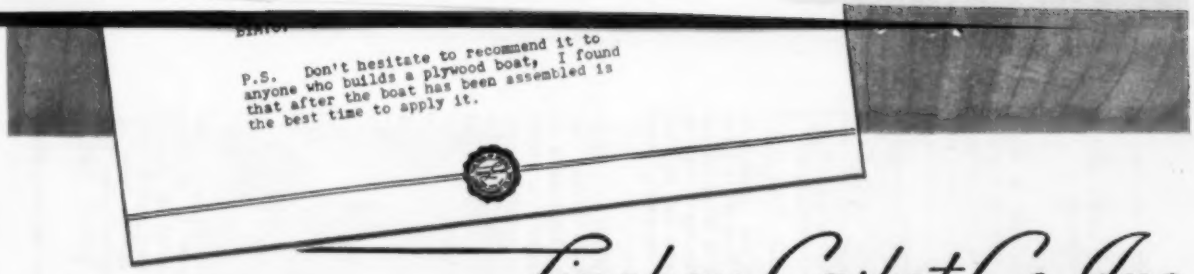
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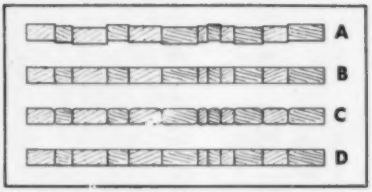


**Fig. 1. Cross sections of lumber core blanks. A. After clamping and before planing; B. planing before drying, apparently, but misleadingly satisfactory; C. core B after thorough drying, showing "sewers" exaggerated; D. planing after proper drying. This smooth surface will not develop sewers after drying even during years of service.**

In more than 40 years of experience in plywood the writer has never known a plywood manufacturer to regret making this final cut, but there have been many instances where it was abundantly clear that failure to make such thin final cuts impaired the appearance and quality of the plywood. It is this bitter experience in the "school of hard knocks" that prompts such unusual emphasis on this final planing operation.

It is quite possible to make cut A and B at one pass through a double surfacer, provided it can be regulated to provide a clean face, and at the same time make the necessary heavy back cut. It is a mistake to consider that such a simultaneous double cut, A and B, is a proper preparation for gluing into plywood, unless provision is made for the finishing cut, C.

The principal features of these surfacing planers for lumber core stock are quite similar, and will be briefly outlined before illustrating the various makes and types of planers, viz.:

Thickness adjustments, wedge or screw.

Feed rolls, solid or sectional, smooth or corrugated.

Chip breakers and their functions.

Types of cutter heads.

Grinding and jointing cutter knives in their operating bearings.

**Thickness Adjustments**

It is the general rule, both in single and double surfacers, that the upper cutting head is fixed in position with its attendant chip breakers, infeed and

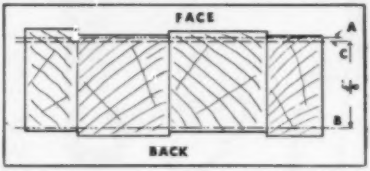


**Fig. 2. Three planings are required in lumber core blanks. A. Thin cut to clean off the face of the core; B. adequate cut to reduce thickness, leaving 1/32" to 1/64" for final face planing; C. final face planing to exact thickness, often 5/8".**

outfeed rollers, all of which have their individual adjustments. In double surfacers, the lower cutting head starts its cut a few inches beyond the upper cutting head. The same supplementary parts of this lower cutting head are integral with the planer bed, all having similar individual adjustments. The controls for thickness are in this planer bed. One type of planer bed has angling

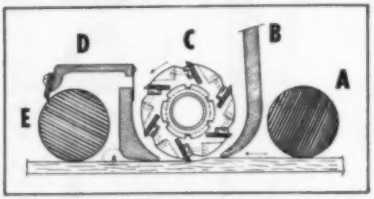


**Fig. 3. Typical diagram of principal planer parts. A. Corrugated on grooved infeed rollers, usually sectional; B. chip breaker's fingers; C. cutting head; D. scraper over smooth outfeed roller, chip breaker chamber and pressure bar; E. smooth outfeed roller.**

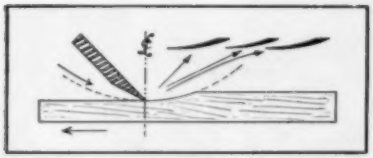

**Fig. 4. Theoretical chips from a single rotating knife.**

ways on its under edges. These ways rest on corresponding, but reversed, angling ways on the central wedge. This planer bed is raised and lowered by moving this wedge in and out horizontally, either by hand or by power attachments. This procedure keeps the bed rigid and perfectly level for any thickness of stock and eliminates any tendency to rock. Another method of raising and lowering the planer bed is by means of several screws, geared together for simultaneous turning under a single control. Most cabinet planers have thickness adjustments ranging from ¼" up to 7" or 8". In mill planers this thickness range may go up to 24".

The preponderance of opinion seems to favor the wedge method of adjusting for thickness, although competent authorities consider the screw method entirely satisfactory for accurate work, especially in small sized planers.

**Fig. 5. Whitney single cabinet planer. Capacity: 24" wide by 8" thick, wedge elevated. Cutter heads: round 4-knife, 3,600 r.p.m., 4½" cutting circle; Feeds: variable, 20 to 60 f.p.m., sectional infeed roll. Jointer: standard equipment.**

### Infeed and Outfeed Rollers

The infeed rollers, with their grooved or corrugated surfaces, to firmly grip the lumber, are in the plane of the upper cutting head. They are usually made in sections, 1" to 2" long, so that they will ride on the surface of the rough boards, and be in continuous contact, with the uneven upper side of the lumber core blank, and across its entire width. Spring devices are used in the sections and segments, as well as at the ends of the infeed roller shaft, to regulate the pressure on the lumber and insure its forwarding at a uniform rate of speed. In some large double surface planers there are two sectional infeed rollers for more positive action.

The outfeed rollers are solid smooth rollers, the surfaces of which must be continuously kept free from chips, shavings and dirt, that might produce indentations or otherwise mar the smoothly planed surfaces. The lower infeed rollers in a double surfacer are also smooth. All infeed and outfeed rollers are driven, and have individual adjustments for rigid, and/or spring actuated pressures.

### Chip Breakers

The primary purpose of the chip breaker is to reduce chips, shavings, splinters and slivers into such small sizes that they can be removed by the dust collector system without clogging. The chip breaker bar is located just ahead of the cutting head, and the ends of the chip breaker fingers, attached to this bar, are held down against the rough incoming surface of the lumber by gravity, by springs or by both. This chip breaker bar can be raised by a hand lever and lowered again, in case

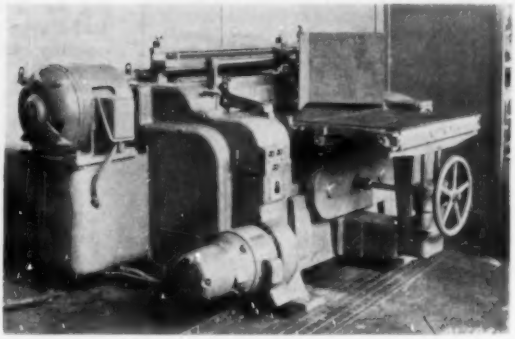

**Fig. 6. Whitney double surfacer planer. Capacity: 30", 36", 40" and 44" widths by 7" thick, wedge elevated. Cutter head: round 4-knife, 3,600 r.p.m., 5" cutting circle. Feeds: variable, 30 to 90 and 25 to 75 f.p.m., sectional infeed roll. Jointer: standard equipment, for both cutter heads.**

any chips slip under or clog the mechanism.

The chip breaker chamber, directly connected to the dust collector system, is tightly enclosed, so that no chips can escape and foul the infeed or outfeed rollers. The back end of this chamber is the pressure bar, bearing down on the planed surface to keep the core blanks from chattering. While a series of chip breaker fingers is the general rule, some planers provide a continuous apron bearing down on the lumber just ahead of the cutting station. In either event the action of the chip breakers is to scoop up all the cuttings, more or less like a snow plow.

The relationship of the feed rollers, the chip breakers, the pressure bar and the cutter shaft are shown in the representative diagram of Fig. 3, which is over simplified and "out of scale" for clarity.

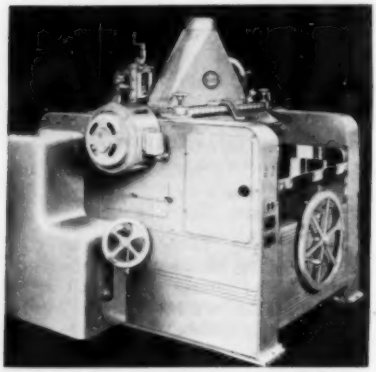

**Fig. 7. Buss single surface planer. Capacity: 24", 26" and 30" widths by 8" thick, wedge elevated. Cutter head: round 4-knife, 3,600 r.p.m., 5/16" cutting circle. Feeds: fixed 30 and 45, variable 23 to 69 f.p.m., sectional infeed roll. Jointer: standard equipment.**

### Types of Cutter Heads

The square cutter head and thick knives, with their attendant dangers to fingers and hands, are rapidly passing out of use, and in new equipment are being displaced by the round cutter head and thin knives with internal clamping mechanisms of various types. This makes for both safety and efficiency. A round head with 6 thin knives is shown in Fig. 3. Four knives are the standard practice in most planers.

While spiral knives have some theoretical advantages, the difficulties of adjustment attending their clamping, grinding and jointing, far over balance any merits they may have. They may sometimes be used in special applica-

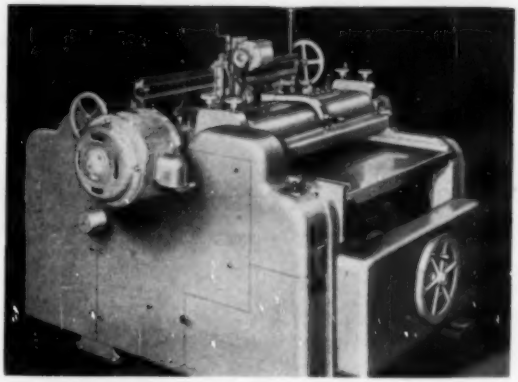

**Fig. 8. Buss double surface planer. Capacity: 30", 36" and 40" wide by 7" thick, wedge elevated. Cutter heads: round 4-knife, 3,600 r.p.m., 5/16" cutting circle. Feeds: variable 25 to 75 f.p.m., sectional infeed roll. Jointer: standard equipment for both cutter heads.**

tions, but the use of straight knives is almost universal in standard planers.

Planer knives cut "into" the grain, i.e., the direction of cutting is against that of the travel of the lumber, so that each knife as it comes in contact with the planed surface, lifts out its proper shaving or chip. The chip breaker fingers also bear down on the wood ahead of the cut and exert pressure to prevent cutting out more than short chips.

The theoretical action of a single rotating knife cutting "into" the wood, without pressure bars or chip breakers, would tend to cut out shavings that are more or less crescent shaped as are shown in Fig. 4. While most chips will be shattered as they are removed, it may be helpful to have the concept of this fundamental phase of cutting by a planer knife.

The measure of smoothness in a planer cut is based on the number of observable cutting marks per inch of surface. These are really infinitesimal ridges between the depressions into which the knife dips in its cutting stroke. This depth is seldom significant where the diameter of the cutting circle is 5" or more, but their frequency is important. A simple computation will show that a 4-knife cutting head, running at 3,600 r.p.m., and passing over a board moving at 30 feet (30 x 12 = 360 inches) per minute, should result in 40 cutting ridges per inch (3600 x 4/360 = 40). In practice, even with the best jointing, one of the 4 planer knives is likely to "lead" and cut more than its proper share. This may be troublesome, depending on the depth to which the "lead" knife reaches. In any event smoothness can be approximately computed as above. Actual ridge frequencies of from 25 to 35 per inch are considered satisfactory for plywood cores, and some authorities advocate even less.

**Grinding and Jointing Cutter Knives**

Jointing is the final finish grinding of the knife edges, as the cutter head runs in its bearings on the planer. This is important, as no knife setting can be sufficiently accurate for smooth planer work. Jointing does not take the place of grinding, as it provides no cutting clearances. Manufacturers of planers furnish such supplementary jointing equipment for top cutter shafts. In double surfacers the lower cutter shaft can usually be drawn out on a bracket

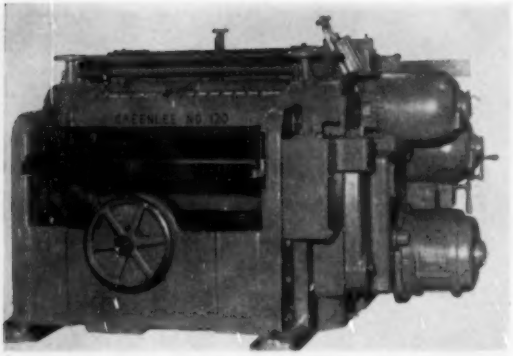

**Fig. 9. Greenlee double planer. Capacity: 30" and 36" wide by 8" thick, wedge elevated. Cutter heads: round 4-knife, 3,600 r.p.m., 5" cutting circle. Feeds: 25, 40, 50, 80 or variable up to 150 f.p.m., sectional infeed rolls. Jointer: standard equipment for both cutter heads.**

for jointing. Jointers have independent motors, and a grinding head moving on a threaded feed shaft.

**Examples of Planers**

There are many types of planers which can be divided into two general classes: mill planers for surfacing long boards in sawmills and lumber yards, and cabinet planers for surfacing dimension stock, furniture parts and plywood cores. The latter produces the highest quality work and is the class that will be particularly emphasized in this article. It is to be regretted that space allows only a few typical illustrations, since some of the major planer manufacturers make a highly diversified line of planers, and of various sizes, each best adapted to a certain class of work.

One of the best known names in the planer trade is Whitney of Winchendon, Mass. A late model single surfacer in their line is shown in Fig. 5. The wedge and hand wheel to regulate the wedge are clearly shown under the table. The jointing device can be noted, mounted over the cutter head. Toward the other end of the Whitney line is the heavy duty double surfacer illustrated in Fig. 6, which in this instance is equipped with an automatic hopper feed and feed belt. It is to be noted that the dimension stock is fed in an angular direction.

Another well known name in planers is Buss of Holland, Mich., who also make a long line of planers. One of their single surfacers is shown in Fig. 7. The casing at the left encloses the variable feed mechanism and the jointing device is just behind the dust collector hood. The handle in front of this

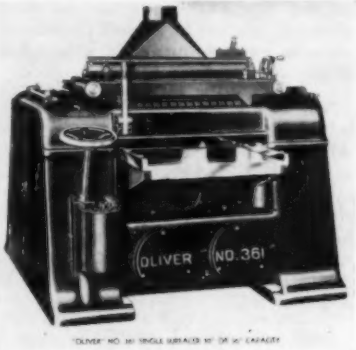


**Fig. 10. Oliver single surfacer: Capacity: 30" or 36" wide by 8" thick, wedge elevated. Cutter head: round 4-knife, 3,600 r.p.m., 5⅛" cutting circle. Feeds: 20, 30, 40, 50 f.p.m. with drum control, sectional infeed rolls. Jointer: standard equipment.**

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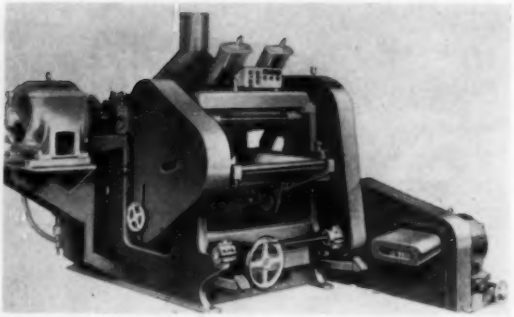

**Fig. 11. Yates-American double surfacer. Capacity: 30" wide by 14" thick, screw elevated. Cutter heads: round 4-knife, 3,600 r.p.m. Feeds 60 to 160 f.p.m., sectional infeed rolls. Jointer: optional equipment.**

hood lifts the chip breakers. One of the double surfacers in the Buss line is illustrated in Fig. 8. This can also be equipped with hopper feed and belt.

The single and double surfacers made by Greenlee of Rockford, Ill., also have established an excellent reputation. This is a heavy duty machine, which can be equipped with hopper feed, and by special arrangements the feed can be stepped up to 150 f.p.m.

**Fig. 12. Power single surfacer, capacity: 20" and 24" wide by 8" thick, screw elevated. Cutter head: round 3-knife, 3,600 r.p.m., 4-11/16" cutting circle. Feeds: 20 to 50 f.p.m., solid infeed rolls standard, sectional optional. Jointer: optional equipment.**

Oliver of Grand Rapids makes an excellent single surfacer, which is illustrated in Fig. 10. The drum control, at the left front, provides speed regulation on a constant torque motor. The wedges for lowering and elevating the table can be adjusted manually or by electric motor.

Oliver also makes a special purpose double surfacer, the "Straitoplane," which is primarily adapted to take the wind out of lumber, but can serve equally well for double surfacing. It was illustrated and described in the November issue of WOOD WORKING DIGEST.

The double surfacer of Yates-American of Beloit, is depicted in Fig. 11. This is a sturdy heavy duty machine that is adapted to lumber mills and flooring plants as well as to furniture factories. Attachments for belt drive are optional.

The single surfacer, made by Power of Philadelphia is shown in Fig. 12, and has its chip breaker fingers held down by weights.

The single surfacer made by Fay & Egan of Cincinnati is illustrated in Fig. 13. This photograph shows the weights for the chip breaker and the jointer attachment over the cutter head. This machine can also be supplied for belt drive.

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The single surfacer made by Orton of San Francisco is shown in Fig. 14 and differs from the others illustrated by having an endless bed (in lieu of fixed table) feed and is especially adapted to millwork on full length boards. Thickness adjustments are wedge operated.

There are doubtless other planers suitable for core stock work, but enough types have been shown to indicate the many desirable features that are available.

**Fig. 13. Fay & Egan single surfacer. Capacity: 24" wide by 8" thick, screw elevated. Cutter head: round 3-knife, 3,600 r.p.m., 4" cutting circle. Feeds: 26 and 50 f.p.m., sectional infeed rolls. Jointer: optional equipment.**

## Conclusions

The machines briefly described and illustrated in this article are general purpose machines and differ from most of those in previous articles in this series, which were largely special purpose machines, limited chiefly to veneer and plywood production. The larger number of these general purpose machines has cramped the space that can be devoted to each, but it is hoped that this review approach will give the overall picture to interested readers.

The machines herein outlined are characterized by high grade workmanship, bear excellent reputations, and

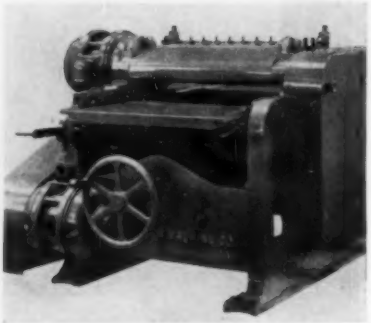

**Fig. 14. Orton endless bed single surfacer. Capacity: 30" and 26" wide by 8" thick, wedge elevated. Cutter head: round 4-knife, 3,600 r.p.m., 5¼" cutting circle. Feeds: up to 100 f.p.m., sectional infeed roll. Jointer: optional equipment.**

all have desirable features that adapt them to efficient work in the surfacing field.

Space does not allow adequate descriptions of the many phases of design, construction and operation in the many types of planers used in the surfacing of lumber core stock for veneer and plywood production. Interested readers are referred to the following manufacturers for more explicit information. These companies have been helpful in supplying photos and data for this article.

**Buss Machine Works, Holland, Mich.**
**J. A. Fay & Egan Company, 2070 Eastern Ave., Cincinnati, O.**
**Greenlee Brothers & Company, Rockford, Ill.**
**Oliver Machinery Company, Grand Rapids, Mich.**
**Orton Machine Company, 390 Fremont St., San Francisco, Calif.**
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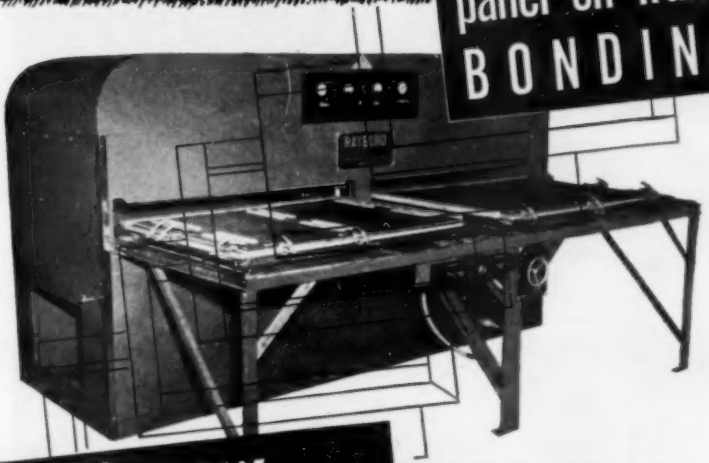

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# TECHNIQUES for Making METAL-FACED PLYWOOD

By Jac H. Tigelaar

THE transportation field is very conscious of the importance of lightweight structural materials. By bonding thin sheets of aluminum, magnesium or steel to a comparatively lightweight core material such as wood in the form of plywood it is possible to have a structural material which based upon values per unit of weight has very high resistance to bending and buckling. Further, this product has very good abrasion resistance, high impact resistance and serves as an impervious barrier to moisture transmission. The partition and side wall panels in the modern coach, parlor and sleeping cars of the railroads are commonly made of a metal-faced panel having plywood as the core material. Other modifications of a sandwich panel are also being utilized in some of the newer freight car constructions.

In the automotive field, structural metal-faced panels have found use for truck bodies. Another very common application has been in the house trailer where the exterior panels consist of a thin gauge aluminum sheet bonded to a composite board such as Masonite.

In aircraft, advantage has been taken of a very lightweight panel having a balsa core with faces of aluminum or magnesium. More recently other constructions using paper, fabric or metal honeycomb as the core material have become very popular.

Structural sandwich panels which are light in weight and which also have good heat insulation properties are being used in substantial quantities as housing for equipment as well as personnel in our defense effort. Panels serving as partitions and curtain walls for industrial and office buildings having both good insulation and fire resistant properties are in great demand.

The above examples, together with many other applications of greater or lesser significance, illustrate the necessity of having proper adhesives and techniques for bonding together an ever increasing range of materials.

To those in the woodworking industry who are acquainted with the problems encountered in making laminates of veneer or lumber, it is quite apparent that a product having metal or plastic bonded to wood presents these same problems, as well as many others. It is the intent of this paper to consider these problems, endeavoring to present some practicable solutions.

Basic in the consideration of these problems is the answer to the question, why do certain chemical materials hold together critical surfaces? Or, in other words, why are certain chemical materials called and used as adhesives? We must, therefore, first of all, give consideration to the underlying causes of major factors of adhesion. Without

becoming extremely technical, it is generally recognized that there are two types of adhesion, both of which function to a greater or lesser degree whenever materials are held together by an adhesive.

A) Mechanical adhesion which involves the interlocking of two surfaces, such as wood and glue. This is essentially what happens when bonding together two layers of wood with a liquid casein glue. Here the glue wets and surrounds the wood fibers at the surface first, and then as it gells and finally sets hard due to chemical action and loss of water, the glue holds the two layers of wood together. A film or powdery layer of the same glue, if placed between layers of the porous wood in the dry condition, would not bond them together because the adhesive and the adherent have not been mechanically united.

B) Specific adhesion which involves certain interatomic and intermolecular action between adhesive and adherent. An example of this type of adhesion might be demonstrated by placing together two very smooth and flat sheets of plate glass which were wet with water. Considerable force would be necessary to pull these apart. Here the thin film of water would be serving as the adhesive, and, for all practical purposes, the bond is not the result of mechanical adhesion.

Another factor, relating to the problem of specific adhesion, deals with the attractive forces between atoms and molecules. Much work has been done in this field by N. H. de Bruyne. He describes these electrical forces as polar and non-polar and has shown that in order to get a strong bond, the adhesive and the adherent should both be either polar or non-polar.

If, then, as some authorities hold, the major part of the strength of an adhesive bond is due to specific adhesion and if the polarity and non-polarity of the adhesive and adherent are significant factors, it becomes apparent that in bonding together metals which are non-polar to wood which is normally strongly polar there are some very important problems to consider.

The author is not qualified to decide just how far it is possible to carry the principles of this latter theory of adhesion insofar as it relates to the subject matter of this paper. Suffice it to say that with our increased knowledge of the forces which play a part in adhesion of similar as well as dissimilar materials, the industry is continually improving the quality of bonds between metals and wood and plastics and wood.

It should be borne in mind that there is no universal adhesive as there is no one specific product employing a combination of metal and wood which meets all the needs of our complex civilization. Performance and service factors determine the selection of the best adhesive for each application. Associated with this is the economical practicability of the end product.

**Preparation of Surface**

A prime requisite in bonding together two materials is that the surfaces be properly prepared. The metal or plastic surface must be free from oil and grease, and in the case of the former, also free of loose oxides. Where bonds of the best quality are required, it is significant to note that finder marks on the metal surface cannot be tolerated. Even a surface which is normally considered clean for paint adhesion may not be clean enough for a good glue bond. Ordinary vapor degreasing of sheet metals may not result in a satisfactory gluing surface. Chemical cleaning is generally considered very desirable.

In order to obtain greater advantage

of the so-called mechanical adhesion characteristic of the adhesive, it is beneficial to roughen the surface of the non-porous metal or plastic. This can be accomplished by abrading the surface with emery paper, sandpaper, metal wool, sand-blasting, etc., after which the surfaces should be washed and wiped to remove all dust particles. When water is flowed over an adequately cleaned metal surface, it will form a continuous and unbroken film. This is a simple and practical test. A rather common method of roughening the surface of an aluminum sheet is to chemically treat it with an alkaline type cleaner. A deep etch can be obtained by using a caustic soda solution. It is necessary with this type of etchant to be sure to neutralize subsequently the alkali with an acid, such as chromic or nitric.

Army Air Force Specification 20032 "Process for Cementing Metal to Metal and Metal to Wood" describes in detail methods for cleaning aluminum alloy, plain carbon steel and magnesium surfaces. The following is the specified method for cleaning aluminum alloy surfaces:

"Aluminum alloy surfaces shall be cleaned by immersing the parts in a cleaning bath, rinsing in running water, followed by immersion in a chromic acid bath.

"The parts shall be immersed in the cleaning bath, maintained at a temperature of 160 to 185 degrees F. for a period of three to five minutes. The composition of the cleaning bath shall be as follows:

"Sodium metasilicate (anhydrous)—3.6 ounces

"Alkyl aryl sodium sulphonate—0.4 ounce

"Tap water—1.0 gallon

"After removing from the cleaning bath, the parts shall be rinsed in running water and the surfaces examined for discontinuity of the water film. If the water film is discontinuous, the parts shall again be immersed in the cleaning bath, as specified above, and rinsed. The cleaning and rinsing shall be repeated until the water film maintains its continuity.

"The parts shall then be immersed in the chromic acid bath, maintained at a temperature of 140 to 160 degrees F. for a period of one to three minutes. The composition of the chromic acid bath shall be as follows:

"Chromic Acid—5% by weight

"Tap water—95% by weight

"After removing from the chromic acid bath, the parts shall be rinsed in cold running water and dried with compressed air."

The above method has found rather general usage in the industry, especially if the bright mill finish of the metal sheet was to be retained. If an etched surface is permitted, then a stronger caustic replaces the sodium metasilicate. Anodizing, if not too expensive for the application, further enhances the quality of the product. The chromic acid process is considered superior to the sulfuric acid process.

Magnesium is one of the newer metals being used in making of structural panels in combination with wood and other core materials, such as paper honeycomb. This metal tends to very readily form an oxide coating on the surface. Special processes have been developed for protecting the surface and giving a good surface for painting and adhesive bonding.

Because of the natural corrosion resistance of zinc coated steel, this metal has been used rather extensively in making metal-faced plywood panels. A plain galvanized sheet does not give a paintable surface; neither is it satisfactory for gluing. It is necessary to give the zinc surface a chemical treat-

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ment. A phosphate type coating is commonly employed. Electrolytically deposited zinc on the surface gives a much better surface although even this is frequently given a phosphate type treatment. The latter is especially beneficial from a corrosion resistant consideration when the metal to wood bond is made with some of the cold setting type adhesives to be discussed later.

It is not practicable to chemically roughen the surface of stainless steel, so the general procedure is to clean it with solvents, and if an improved bond is desired, a mechanical roughening is given to the surface.

There are many companies who specialize in furnishing equipment and chemicals specifically designed to give sheet metals a surface satisfactory for painting. The general opinion seems to be that if the surface is of such a nature so as to give good paint adhesion, it will also be satisfactory as a gluing surface. This is not necessarily true. It can be readily demonstrated that with a protein-latex type adhesive, a so-called clean, smooth aluminum alloy surface does not give as good a bond as a surface also roughened by chemical etching or mechanical sanding. Tensile shear tests or peel tests made in the normal dry condition may not show this difference. Specimens soaked in water for one or more days and then tested shows a marked difference in favor of the roughened or etched surface. This condition obtains also with the cold press rubber cements but is not nearly so evident with the less wettable hot press synthetic resins.

With respect to the preparation of the surface of plastics, some generalizations can be made. The more rigid and generally considered thermosetting type plastic sheets should be roughened by sanding or similar means. Recently developed equipment involves the use of brushes, which is economic-

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ally practicable for surfacing plastic sheets (melamine, phenolic and polyester treated paper or fabric). The machine also gives a good surface to aluminum.

Wood surfaces generally require no specific preparation, except that they be free from oil, grease and other foreign material. In the case of plywood which has been pressed at high temperatures and pressures, it is desirable to sand the surface lightly.

The scope of this paper is not intended to include or consider the more flexible and thermoplastic sheets, such as vinyl, cellulose acetate, polyethelene, etc.

The bonding of metal to wood can be divided into two general categories, as based upon general gluing procedures. The first is the so-called cold press or room temperature method, which, as the name implies, requires the use of cold-press gluing equipment and techniques. The second is the hot press method, which requires some means of heating the assembly while under pressure.

The quality of glue bond needed in the final product, as well as the cost which can be tolerated and the equipment available, determine, to a great extent, the specific adhesive which will be used and the method of making the bond. For normal commercial applications, it is generally assumed that the cold press methods are most practicable. With the great increase in number of hot presses available, as well as the improvement in temperature, pressure and other operating controls, this assumption is becoming less correct with the passing of time and the developments in adhesives.

The cold press methods generally are less expensive primarily because the equipment is more simple. Because of the great difference in the coefficients

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of expansion of metal and wood, there are many practicable difficulties in making a flat panel when bonding by the hot press method. As the required bonding temperatures increase, the stresses on the glue lines also increase when the final assembly is brought back to normal temperature. A common procedure when using temperatures above the boiling point of water is to cool the assembly while under pressure. In the case of a steam heated platen press, this can be done by cooling the platens with water. In the case of applying a metal sheet to one side of a plywood panel, one cannot expect to get a flat panel by the hot press method. For a balanced panel (metal on both sides), this difficulty is not as great.

The hot press method, however, may, in general, be considered to give a glue bond of higher quality. Where glue bonds are required which possess such properties as high water resistance, good aging characteristics and extremely high strength properties in peel, shear and flexibility, this general method can be expected to be adaptable.

The author believes that one of the most important factors to consider when bonding metal to wood for the more common commercial applications is the corrosive characteristics of the adhesive. It can be demonstrated that a sheet of aluminum or zinc coated steel will corrode much more quickly in the area where it is in contact with wood (no specific species) than where it is in contact with only the humid atmosphere. Because of this condition, the adhesive should be preferably a non-electrolyte and also not wettable with water after cured or set. For certain structural panels having metal on both faces and with the edges sealed, it also is very important that the moisture content of the wood core be kept low, especially if the adhesive film does not


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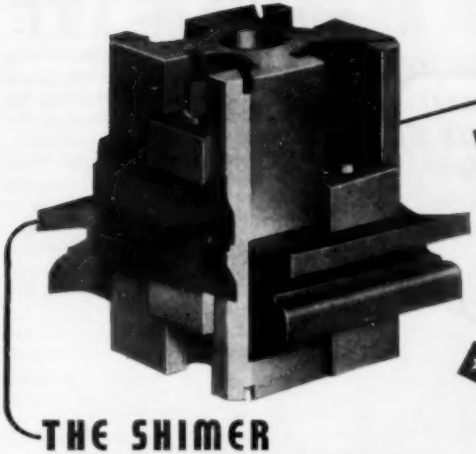

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form an impervious water barrier between the two adherents.

In a previous paragraph, mention was made of the flatness of the final panel. This is an important consideration for most applications, and it becomes especially significant when the areas represented are comparatively large. With hot pressing techniques, it is essential that the cooling process be such as to cool both surfaces uniformly. If this is not done, the stresses will cause warpage. It is also equally important to have uniform conditions during the heating cycle. The trial and error method for each adhesive is perhaps the most practical solution. This problem is much less significant in cold gluing because there are no stresses due to differences in coefficients of expansion. In the matter of making a product having an unbalanced construction, such as metal or plastic on one face of plywood, the maintenance of flatness is very difficult, if not impossible. First of all, it can be said that to make such a product by the hot press method and expect it to be and remain reasonably flat is more of a wish than a reality. In cold pressing, the possibility is much greater especially as far as initial flatness is concerned. It is not possible to retain flatness because the construction is unbalanced; and, with the changes in humidity conditions, the wood will expand and contract resulting in stresses which manifest themselves in warpage. When making a product of this nature, a good rule of thumb to follow is to bring the plywood down to such a moisture content prior to bonding that whatever is added in the bonding operation the resultant average moisture content for the wood will be the same as is to be expected in service. Even then, changes in exposure conditions will produce stresses which may cause the panel to warp.

Since the several types of adhesives involve techniques which are distinct,

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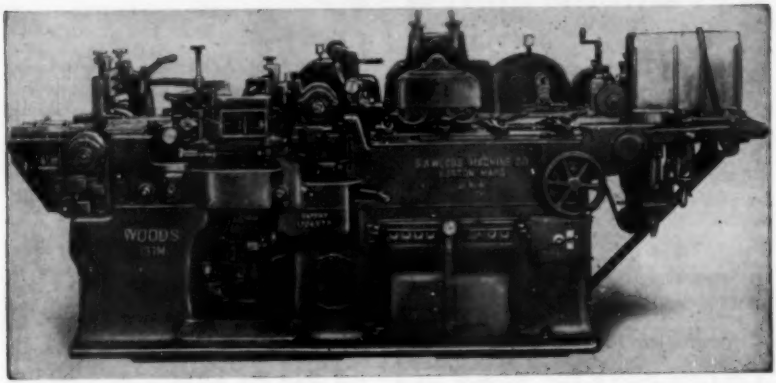

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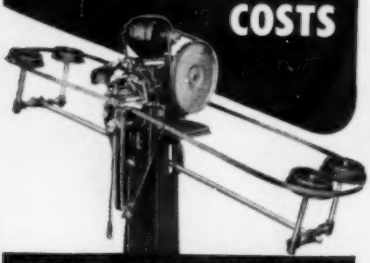

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we will discuss the techniques and type of adhesives simultaneously and consider them on the basis of the two general gluing methods mentioned above.

**I. Cold Press**

**A. Rubber Adhesives:** This includes a very large number of cements or adhesives having natural or synthetic rubber as the base, generally in an organic base solvent. The techniques employed in bonding vary with the adhesive and with the ultimate quality and type of product.

Perhaps the most common procedure is to apply the adhesive to either or preferably both of the two surfaces to be adhered. The glue is applied by brush, spray or roller coater. It is allowed to air dry for a specified time and then the surfaces are placed in contact with each other. Pressures ranging from essentially zero to a few hundred p.s.i. are applied to the assembly for a fraction of a minute up to several minutes.

There are many variations to the above general procedure. One of these which has been used successfully for several years incorporates these principles in bonding a metallic sheet to a composition board, such as Masonite. The solvent is evaporated by passing the sheet through an oven of infrared lights. This also "activates" the adhesive because at the elevated temperature it becomes less viscous being thermoplastic in nature. The metal sheet is then laid on the adhesive surface and the assembly passed through a set of pressure rolls to effect the bond. This type of operation is economically practicable for volume production on a product which can tolerate a rubber type cement.

There are several possible methods for applying the adhesive to the surface. For very limited production, it may

be practicable to deposit the adhesive film by brushing. Spraying is another common method. This, however, usually requires specially developed nozzles and guns and techniques peculiar to each adhesive. The deposited film tends to be spotty and globby. Many of these adhesives are also applied satisfactorily with a flow gun or by knife coating. The most prevalent method is by means of a roll coater which permits good control of quantity of adhesive applied and is economically practicable providing the production run is not too small.

A rubber adhesive film develops its strength due to the loss of solvent. The solvent is present primarily to give a satisfactory consistency for application and to wet the surfaces of the materials to be bonded. The more common bonding techniques are:

**(1) Wet Bonds:** The adhesive is applied to the least porous surface and the other surface is brought into contact at once. This bond may be satisfactory where exceptionally high strengths and resistance to cold flow are not required.

**(2) Tacky Bonds:** The adhesive is applied to one or both surfaces and allowed to air dry until an aggressive tack is developed. The time for this is dependent upon several factors, including temperature, humidity, air circulation. The surfaces are brought together during this tacky stage. Pressure is applied to assure intimate contact. Time under pressure may be momentary to several minutes.

**(3) Reactivated Bonds:** This technique is usually more applicable when bonding together two surfaces which are impervious to passage of solvent or when it is not practicable to dry both surfaces to the optimum stage at the same time. High pressure plastic laminates are often bonded to plywood by


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this method. The adhesive is applied to the surfaces, allowed to air dry for an indeterminate time, even up to several weeks, and is reactivated by wiping the surfaces with the proper solvent and making contact immediately.

**(4) Pressure-Sensitive Bonds:** There are available rubber adhesives which, when dry, are tack-free to the touch or in contact with other materials. However, when two coated surfaces are brought together under comparatively low pressure, a bond is established.

**(5) Chemically Cured Bonds:** A two part adhesive is used. One is a catalyst or "accelerator" which, when mixed with the other, initiates a cure of the mixture. Because the curing begins at once, the time limit of the pot life of the adhesive mixture is short. After applying the adhesive to both surfaces by brush or roll coater, the assembly is made at once and put under pressure for several hours depending upon temperature.

**(6) Combination Bonds:** Another production method being employed successfully in bonding metal to wood incorporates the use of two rubber type adhesives. This apparently takes advantage of the fact that adhesives differ in polarity (see above), and the specific adhesion to the adherent is determined by these forces. An organic solvent type rubber base adhesive is applied as a prime coat to the metal. This is forced or air dried. The primary adhesive, a water-dispersed rubber base material, is applied to this primed surface of the metal and to the wood surface. These components are then air dried or passed under a bank of infrared lights for three minutes at a temperature of 150° F. The assembly is then laid up and held under pressure for about three minutes.

**B. Protein-latex:** This type of adhesive has been used in the commercial production of metal-faced plywood panels for at least 25 years. The protein (casein, blood albumin) has no great degree of specific adhesion for metals. Water-dispersed rubber lattices (natural and synthetic) are much better in this respect. A proper combination of the rubber latex and protein develop good bond strengths. With the proper formulation of ingredients and proper surface preparation of the metal or plastic and wood, the bonding techniques are comparatively simple. The adhesive is applied by brush, roll coater or spray to either of the two surfaces, and the assembly is held under clamp pressure for 8-16 hours. This adhesive "sets" principally through the loss of water. Having once lost the water through dissipation into the wood, the adhesive loses its property of being soluble or miscible in water and becomes highly water resistant.

**C. Combination Primer and Cold Setting Glue:** There are commercially

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available adhesive materials which have a very good degree of adhesion to metals. These are applied to the metal surface by conventional methods. The usual procedure is to air dry and follow with a bake or cure for several minutes at elevated temperatures. It is desirable that the surface of this primer lack a high degree of smoothness. This can be accomplished by method of application or else by roughening it after baking with a coarse sandpaper. The bond between the prime coat and the wood surface is made with a cold-setting resin adhesive such as urea, phenol, resorcinol type by using regular wood-bonding techniques.

**D. Synthetic Resins:** Within the past few years there have been developed a number of resins which are being used to an ever increasing extent in bonding metal to metal and metal to wood. This class of resins are known as the epoxies. There are several variations available, depending upon the working, physical, chemical and quality and economic characteristics desired. In general, these resins are very expensive, costing at the present time as much as $2.00 or more per pound. The primary usage is for metal to metal bonding where little or no external pressure can be applied. This type of resin cures very rapidly when the proper catalyst is added. The chemical reaction which takes place is highly exothermic and thus the pot life of the mixture is very limited.

Certain formulations of this type of adhesive are considered as 100% solids. This means that they set without evolution of volatile by-products. Generally also the setting is accomplished with no material shrinkage. These characteristics make the resin not only suitable for bonding metal or plastic to wood, but also for bonding together impervious materials, such as metals, ceramics, rubber and glass.

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ant type of urea resins has been very successful in bonding decorative plastic laminates to plywood for table tops and similar applications. Also, the resorcinol, resorcinolphenol, cold-setting phenolic, and casein glues are being used successfully. The surface of the laminate is first roughened by sanding. The water solution of the resin is applied by customary means to the wood and the assembly is cold-pressed. It is possible to get satisfactory bonds at comparatively low pressures. Especially where fir plywood is used, this low pressure feature is very desirable because it prevents the hard and soft spots from telegraphing through to the glossy surface of the decorative laminate.

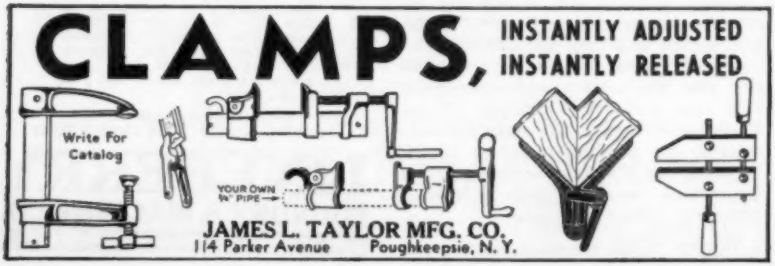
**II. Hot Press**

**A. Resin-rubber:** This type of adhesive, comprising a combination of synthetic resins and synthetic rubber, has become very common during the past decade. During World War II the aircraft industry, in particular, was in need of adhesives for bonding metal to metal to replace the time-consuming riveting procedures. Many formulations have been developed in the intervening years. Not only have these adhesives proven satisfactory for metal to metal bonding, but they also are used for metal to wood bonding where high strengths and very good durabilities are required. A straight resin adhesive is very strong and rigid, it tends to be brittle and often exhibits poor adhesion to non-porous surfaces, while a rubber adhesive is flexible and may have too much elasticity although it has good adhesiveness to metal. The proper combination results in exhibiting the merits of both without either of their disadvantages.

There are several liquid type adhesives of this general composition. The working properties of the uncured composition, as well as the physical properties of the final glue bond, are dependent upon the particular composition.

The general technique in using a typical formulation can be given as follows: The adhesive having a low solids concentration in an organic solvent is applied to each of the surfaces to be bonded by brush, spray or roll coater. In order to build up a sufficient film thickness, several applications with air or force drying between each may be required. A further drying or precure so as to remove all solvents in recommended. This may require 15 to 30 minutes at a temperature below the boiling point of water. The assembly is then subjected to temperatures between 300 and 400 degrees with pressures up to several hundred pounds per square inch depending upon compression resistance of the components being bonded.

In the aircraft industry, it is usually not possible or practicable to make

secondary glue joints between metal and wood. Common procedure is to bond a thin wood veneer to sheet aluminum or stainless steel with a rubber - resin adhesive. This veneer surface then can be bonded with a cold-setting resorcinol resin to the other wood part.

**B. Thermosetting - Thermoplastic Resin Combinations:** There are combinations of resins which have given very good metal to metal and metal to wood bonds. The one component is a synthetic resin of the phenolic type which cures (becomes insoluble and rigid) when subjected to heat. The second component, also a synthetic resin which may be of the formal or butyral type, remains plastic even when heated for long periods at elevated temperature. The mixture, however, when properly cured, exhibits the general properties of a thermosetting resin.

"Redux"[1] is an adhesive of this type. It has been in use in England and this country for over ten years especially for making high strength bonds between metal parts in the aircraft industry. The process requires extreme care in proper cleaning of the metal surface. The one component, in liquid form, is applied to the surfaces; and before it has dried, the second component, in powder form, is sifted on the wet surface of the metal. The excess powder which does not cling to the liquid should be tapped off. After an open assembly time of at least 30 minutes (most common is from a few hours up to two days), the assembly is made and put into a hydraulic press with platen temperature at about 300° F. The curing time is comparatively long—about 30 minutes.

The general type of adhesive is also available in the liquid form—the mixture of resins being dissolved in organic solvents. The viscosity is usually rather high in comparison with

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the solids content, in this respect being much like lacquer. One proprietary resin of this type at about 20% solids has a viscosity in the general range of 20 to 30 seconds in an ASTM No. 25 cup at 25° C. Either surface is coated with the adhesive, the solvents are removed by normal air or force drying, and the assembly is subjected to a pressure of 25 to 200 lbs. per sq. in. for several minutes at temperatures between 300 and 350° F.

For bonding small parts or components which do not lend themselves readily to coating with the liquid resin, this type is also available in the film form. It is supplied as a tack-free unsupported film[2] approximately two mils thick. There are also available commercial sheets on glass fabric base with varying amounts of resin coating.[3]

Bonds made with this type of adhesive have considerable resistance to water, alcohol, organic solvents, oil, etc. They also have exceptionally high shear strength and resistance to creep under sustained loads. This latter property, however, holds only at temperatures below 200 to 250° F. At higher temperatures, the bond tends to show thermoplastic characteristics.

**C. Synthetic Resins:** The epoxies or ethoxylene resins are cured at elevated temperatures as well as at room temperature. Several formulations of this type of resin have a high degree of specific adhesion for most non-porous surfaces and readily wet the surface. It is thus possible to get good bonds without requiring high pressures.

The resin, supplied in a liquid condition, has a reasonably good storage life at room temperature although it is best to store in a cool place. It can be applied by brush or spray. Precautions are necessary because the solvents are inflammable. Although not essential, it is best to air dry the open assembly at a temperature below 120° F. After drying, the components can be assembled and cured at once; or the curing process can be delayed up to several months. The resin melts at a temperature of about 250° F. so in order to get a bond having high shear strengths and good resistance to solvents, the curing temperature should be above the melting point. The time required to cure the resin depends upon the temperature. One-half hour at 400° F. gives very good results. At 300° F. the time is increased to about 4 hours.

The disadvantage of long curing time at high temperatures for this type of resin is offset by the fact that only good contact pressures are required. Therefore, the curing can be done with clamp pressures in ovens without requiring hydraulic presses with heated platens. Because of the comparatively high cost of the resin, the use thus far has been in bonding small parts rather


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than in commercial applications involving products having large areas.

**Conclusion**

The foregoing covers only a small part of the many factors involved in bonding metal and plastics to wood. By listing several of the types of adhesives available, as well as their general working properties and other physical characteristics, it is hoped that this will serve as a preliminary guide in the selection of a specific adhesive for a particular job.

**Acknowledgments**

The preparation of this review has been made possible by the cooperation of many companies in the adhesive and related fields. Material from the following companies has been used as background for the foregoing presentation:

American Cyanamid Co., New York City
Armstrong Cork Co., Lancaster, Pa.
Armstrong Products Co., Warsaw, Ind.
Bloomingdale Rubber Co., Chester, Pa.
Borden Co., Chemical Division, New York City
Ciba Co., Inc., New York City
Cycleweld Cement Products, Div. of Chrysler Corp., Trenton, Mich.
Houghton Laboratories, Olean, New York
Met-L-Wood Corp., Chicago, Illinois
Minnesota Mining & Manufacturing Co., St. Paul, Minn.
Rohm & Haas, Philadelphia, Pa.
Shell Chemical Corp., New York City
Snyder Chemical Corp., Bethel, Conn.
U.S. Plywood Co., New York City

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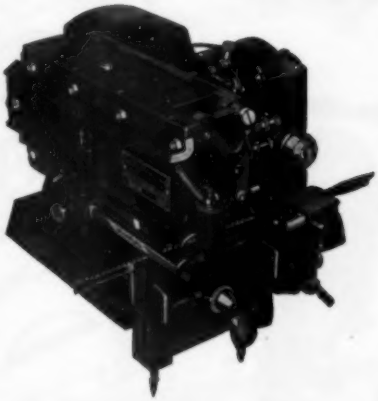
[1]Trademark of Ciba Co., Inc.
[2]Minnesota Mining & Manufacturing Co.
[3]Bloomingdale Rubber Co.

**This paper was originally presented at the 1953 Annual Meeting of the Forest Products Research Society. Mr. Tigelaar has rewritten parts of it and the entire article is used here with permission.**

**REPLACES 2 MACHINES**



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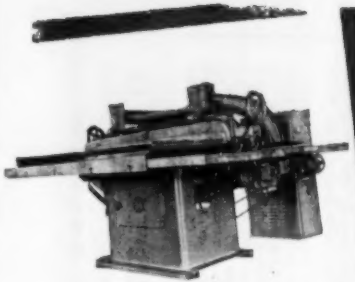

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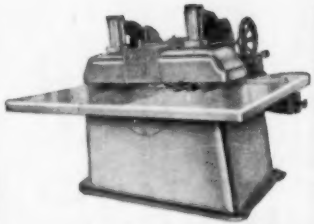
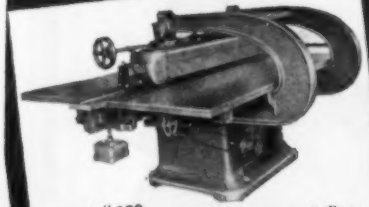


Diehl #99 Multi-Rip Saw



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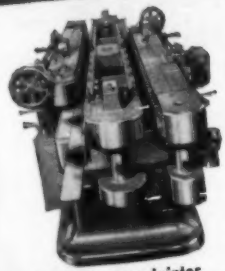

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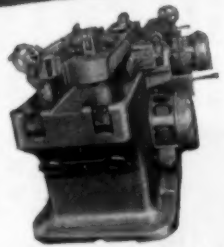

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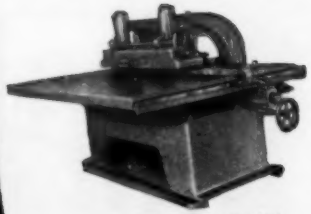

Diehl #750 Straight Line Glue Joint Rip Saw

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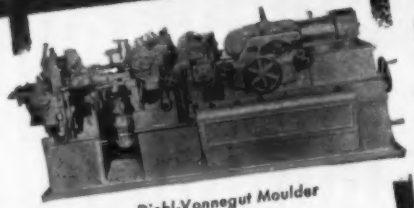

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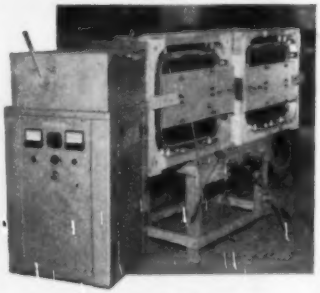

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Prior to assuming this post, Mr. Bescher was manager of the Division's Technical Department which operates development and control laboratories In Orrville, Ohio. His successor as head of the Technical Department will be Dan L. Davies, who has been assistant manager in charge of sales service and quality control.

## VICE-PRESIDENT FOR ROCKWELL

F. P. Maxwell has resigned as president of the Acro Manufacturing Company, Columbus, Ohio, to accept the newly created position of vice-president of the Rockwell Manufacturing Company's Power Tool Division. In his new position with Rockwell, Mr. Maxwell will have charge of all activities for the

## Sturdy, Strong, Band-Saw Guide

MODEL 20

**Paddock**

BALL-BEARING

**BAND SAW GUIDES**

Do you want faster, smoother, safer Band-Saw operation? Install **PADDOCK BALL-BEARING BANDSAW GUIDES.** Model 20 fits all machines having 2½" back of blade to guide post. Works above or below saw table. Interchangeable ball-bearing wheels run with blade to give friction free blade support. Cut-away section in photo shows grooved wheel that supports back of blade. Two side wheels support sides of blade. Designed for ⅛" to 1¼" wide blades. Models for large or small machines. Write for details, give size, and make of machines.

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**WHERE VALUE IS QUESTIONED**

**PADDOCK TOOL COMPANY**

*Guide Makers Since 1920*

**1418 Walnut Street • Kansas City, Missouri**

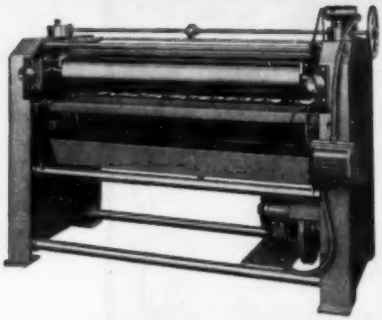

Power Tool Division, one of two major divisions making up the Pittsburgh firm.

### GLEN H. MATTHEWS

Glen H. Matthews, sales manager of metalworking machinery of Mattison Machine Works, died November 14, at his home in Rockford, Illinois at the age of 62 years. He had been ill seven months.

Mr. Matthews was born in Irontown, Ohio, April 14, 1891. He was associated with Mattison Machine Works for 29 years. To begin with he sold Mattison woodworking machines throughout the country and was particularly well known in the Detroit area when auto body parts were made of wood. Later Mr. Matthews was Sales Manager of the metalworking division of Mattison Machine Works and was well known throughout the industry.

# a UNION machine...
## TO MEET ANY WOOD GLUING NEED



Name of Union agent in your territory supplied on request.

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*Write for your free copy of Union Booklet, "The How's and Why's of Wood Gluing," by Thomas D. Perry.*

**UNION TOOL CORP.**
300 EAST MARKET STREET
**WARSAW, INDIANA**

UNION SERVES OVER 2,000 SATISFIED CUSTOMERS

**UNION AUTOMATIC ROLLER COATER**

Unexcelled for accurate, economical operation in spreading all types of coatings. Standard models take sheet widths from 12" to 108"; thickness variance from 0" to 2". Available with hollow rolls to permit circulation of cold water through them, thereby prolonging the pot life of resinous adhesives. A reduction of 15° will double your pot life. Available with rubber-covered doctor roll at no extra cost.

•

Union makes equipment for every standard production job in wood gluing. Also designs and makes machines fo special applications—including machines for electronic gluing. Write for data on the complete Union line.

• • • •

**USERS SAY UNION CUTS COSTS — SPEEDS PRODUCTION**


### DOIG APPOINTMENTS

Wm. S. Doig, Inc., 894 Manhattan Ave., Brooklyn, N.Y., manufacturer of nailing machines, has announced several appointments. H. H. Muenzing is the new treasurer of the firm and Wm. E. Wentworth will serve as sales manager.

### AMERICAN FORESTERS ELECT

Elwood L. Demmon of Asheville, N.C. was elected in December as president of the Society of American Foresters for the two-year term 1954-55. He succeeds George L. Drake of Shelton, Wash., who was not a candidate for re-election.

Mr. Demmon has been vice-president of the society during the last term. He is director of the Southeastern Forest Experiment Station, a unit of the Forest Service, U.S. Department of Agriculture.

DeWitt Nelson of Sacramento, Calif. was elected vice-president of the society. He is director of the California Department of Natural Resources.

This society was organizing in 1900 with headquarters in Washington, D.C. It has a membership of 9,600 professional foresters in the U.S. and Canada.

### LUMBER GRADING SCHOOL

Under the sponsorship of the John Widdicomb Co., Grand Rapids, Mich., and conducted by Erwin Gutsell, field

**WANT TO CUT COSTS?**

Then let Southern's HIGH QUALITY Wood Screws work for you, to speed up production and reduce rejects.

Southern Wood Screws are precision made. Their sharp gimlet points start fast and hold tight, cut through wood without tearing. Produce **quality** results at a lower cost, to put your product in the best competitive position.

A Southern Wood Screw for every need, ready to ship from stock. All made to Federal Specifications FF-S-111a.

Screws in bulk Lubricated Free upon request.

Phillips or Slotted

Flat - Round - Oval

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**SOUTHERN SCREW COMPANY**

**STATESVILLE, N. C.** • *MANUFACTURER OF WOOD SCREWS*

FACTORY WAREHOUSES:

North Bergen, N. J. Chicago 10, Ill. Los Angeles 23, Calif.

representative for the National Hardwood Lumber Association, a short course in hardwood lumber grading and measurement began January 11. The course was given at the John Witticomb Co. and is the third five-day course to be held there.

## COURSE IN GLUING

A short course in wood gluing will be offered by the State University of New York College of Forestry at Syracuse, February 1 to 5. The course is intended for wood industry representatives.

Another in the series of courses and institutes offered for industry personnel by the College of Forestry, the wood gluing course will cover such topics as principles of gluing, preparation of stock for gluing wood adhesives and their characteristics, hot and cold press gluing techniques, radio frequency gluing, strength tests for glue joints, and gluing defects.

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**JEWEL BRAND**

**Abrasive Belts**

*Finer finishing — sanding, smoothing, polishing — for all types of wood products.*

**ABRASIVE PRODUCTS, INC.**
**551 Pearl Street** **South Braintree 85, Massachusetts**

# EQUIPMENT and Supplies for the WOODWORKING INDUSTRY

## WHITNEY FACING PLANER

Baxter D. Whitney & Son, Inc., Winchendon, Mass., announces the addition of the facing planer, the 600 New-matic facer, to their line of planers and shapers. It is being introduced to fill a need for a heavy duty facing planer for rough cut lumber to remove the warp of crookedness preparatory to surfacing or to remove the glue and uneveness from built-up cores or panels prior to surfacing.

It is built in 24" and 36" widths and is of revolutionary design in that the stock feeding mechanism consists of a specially constructed rubber fabric endless belt with pneumatic rubber feed fingers mounted in replaceable sections on the belt. These fingers with their pneumatic action yield to the irregularities of the stock but assure a firm, positive feed without straining or distorting the lumber. This type of feed is simpler in construction than the conventional type and is more resilient and much quieter in operation.

The upper feed works is supported on four large ball bearing screws, thereby eliminating any overhang of the feed works frame. It is raised and lowered for different thicknesses of stock by power hoist, with push button control or by manual operation.

The feed mechanism is driven by a variable feed unit for obtaining any feed desired. The feed is controlled by push button and is also provided with automatic and manually controlled safety devices at the front and rear of the machine for preventing overload and to prevent two boards, one on top of the other, from being fed into the machine.

The machine has a heavy duty 4-knife ball bearing cutterhead with 5½" diameter cutting circle operating at 4,600 r.p.m. and driven by means of a V-belt from a 3,600 r.p.m. motor.

The bed or base supporting the cutterhead, feed tables and feed works is of fabricated steel rectangular construction rigidly braced to form a firm and solid foundation for the machine. The infeed table is adjusted for thickness of cut by means of the unique arrangement which maintains alignment and a constant distance from table to cutting circle at all depths of cut.

## FINISHING SANDER

The first finishing sander to incorporate a vacuum dust pick-up system has just been introduced by the Porter-Cable Machine Company of Syracuse, N.Y. This portable electric tool, Model 127, picks up 91% of the wood dust which results in 25% faster removal of stock, we are told.

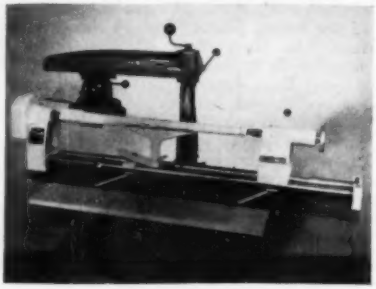
There are several reasons why it is important to exhaust the wood "flour" into a bag. Dust which is not removed quickly loads up under the sandpaper and becomes embedded between the grits. Actual tests show that by constantly removing the wood dust the machine sands more than 25% faster, and the life of the sandpaper itself is greatly extended. Removal of the fine powdered wood also frees the workroom and the operator from the annoyance of dust-laden air, and eliminates any possibility of fire.

Using a coarse abrasive, the Porter-Cable sander will grind down wood rapidly and is practically impossible to stall under heaviest hand pressure. With a fine sandpaper it will produce a glass-smooth furniture finish.

A powerful aircooled motor and gearless design assure continuous trouble-free operation. Weighing only 6 lbs. 10 ozs., this compact sander can be used conveniently in any position for long periods of time without overheating. No lubrication is necessary. The frame is die-cast polished aluminum with a pistol grip and trigger switch. It measures only 4¾" wide, 9½" long, and 6½" high. A steel carrying case is available.

## DEWALT INTRODUCES NEW LATHE

A new lathe capable of turning stock up to 12" in diameter and acommodating spindles up to 37" in length has been introduced by De Walt Inc., Lancaster, Pa. While designed primarily as an attachment for the De Walt Power Shop, the lathe can also be used as an independent workshop item. It can be mounted on any workbench and powered by any type motor.



The development of the new lathe follows on the heels of a new model of the De Walt Power Shop, redesigned so that it can handle large sheets of plywood or composition board. The De Walt Power Shop, a multi-purpose power tool, can now rip to the center of any length panel up to a width of 48". Basically a radial arm saw, the De Walt Power Shop can be quickly converted into a dado machine, shaper, router, disc, drum or belt sander, boring machine, lathe, surfacing machine or saber saw.

## NEW ADHESIVE

Metal parts, rubbing on wood during the assembly of television sets, release small wood chips and dust which eventually penetrate into the operating parts of the set. This may cause early service calls, which are very expensive to the set maker.

National Adhesives, 270 Madison Ave., New York City, has developed Resyn 35R2625, a permanently tacky, solvent type adhesive, which helps eliminate this expensive production problem.

A thin film of adhesive is painted on in all areas where there is contact between the cabinet and metal parts, especially around the ventilating area, speaker housing, installation tracts, etc. As the chips and dust fall, they are easily trapped on the tacky film, thereby keeping the inside of the set clean.

Resyn 35R2625 should also be of interest to all assemblers of radio sets, as well as all types of precision equipment, sold in wood housings.

## MACHINE FOR DRAWER FRONTS

A new machine is now offered for multiple ripping, cross cutting and grooving of furniture case goods parts. It will produce practically any number of drawer fronts in one pass of a large panel through the machine.

Known as the Mereen-Johnson No. 435-H slat bed machine, it is a variation


Supreme BAND SAWS

END YOUR TROUBLES

SUPREME BAND SAWS cut faster... have increased cutting capacity with minimum breakage! Present day high speed equipment demands Supreme Saws. Free from kinks and imperfections. Made from the finest Special Nickel Alloy Steels, tempered for toughness ...to stay sharp! There is a Supreme Band Saw for every industry... for every material. Special purpose saws are made to order.

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THE SAW & KNIFE SPECIALTY CO., INC.
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presents
KING E-Z SAFETY FEED

- Powerful
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LIGHTER MODELS AVAILABLE

Money and time saved by this versatile SAFETY FEED! Switch from Shaper to Jointer, Saw or Sander quickly and conveniently. No complicated setups. Make or brand of machine does not prevent use of E-Z Feed. Sand exposed edges of furniture panels in half time required for hand feeding. Fluting, grooving, etc. on saw become SAFE operations. Hazardous jobs on jointer made safe and easy. Write for Further Information.

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173 LAFAYETTE ST.
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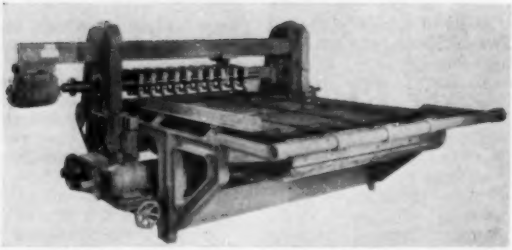


of the well known No. 435-H multiple cutoff saw line. In addition to furniture work, the machine handles such sheet material as plywood and hardboard, cutting it into very accurate squares. Manufacturer is the Mereen-Johnson Machine Co., Minneapolis 12, Minnesota.

An important feature is the possibility of very close spacing of the saws. It can be arranged for use with either solid or split-in-half saw blades.

Like the parent cutoff saw, this machine has Mereen-Johnson's exclusive beam type arbor mounting in which all arbor bearings are jigged to the overhead beam for proper bearing alignment. Wooden slats are for support only as the actual feeding of material is by metal feed lugs attached to metal lug bar.

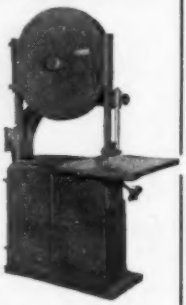
---

A receding chin is considered a handicap in practically all of the pursuits of life except eating corn on the cob!


**INVESTIGATE CRESCENT**

**36-IN. BANDSAWS**

- Massively constructed
- 3 or 5 hp direct or V-belt drives
- Ball bearing guides
- Hand wheel tilt table
- Wood or metal cutting



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SUBSIDIARY OF WM. K. STAMETS COMPANY
MACHINERY BUILDERS & ENGINEERS
PITTSBURGH

Columbiana, Ohio, U.S.A.

**STOP DUST**

DUSTKOPS — UNIT TYPE LOW COST — 20 Models — 300 to 3600 cfm — ¼ hp to 5 hp

*AVAILABLE FROM STOCK*

For: Grinders, buffers, polishers, woodworking, lint . . . All Dusts.

*Send for Cat. 605a; describe problem.*

AGET-DETROIT CO. • ANN ARBOR, MICH.

**MAX. 16" & 20" DISC SANDERS**

Rugged, Dependable Lowest Priced

16" Model Complete with ½ HP 1 ph. motor, switch and cord .....$228.33

20" Model Complete with 1 HP 3 ph. motor, switch and cord .....$388.81

Unsurpassed for surfacing wood, metal, plastic, etc.

30" Model coming up.

Send for free descriptive literature. Dealer inquiries invited.

**MAX MANUFACTURING CO.**

138 Stockton Ave. San Jose 26, Calif.

# New Literature

### REDCO BOOKLET

Here is a new 8-page booklet on precision grinding equipment. It is Bulletin M-104, published by the Redco Tool Div., Red Lion Cabinet Co., Red Lion, Pa. The booklet shows how Redco's production planned tooling program increases production quality. Illustrations of Redco carbide tipped tools are shown. These include: saws, molder heads, shaper heads and knives, cutters and router bits. The firm's precision grinder is illustrated and specifications given.

A two-page spread in the center of the book shows the various grinding attachments and their uses. Redco has also a profile cutter grinding attachment which is described on the inside back cover.

### CHAIN MORTISE GEAR

The General Chain & Belt Company, 292 Lafayette St., is now handling the Renold chain mortise gear. The complete gear consists of a mortise chain, guide bar and sprocket. It cuts clean, accurate holes at high speeds in all kinds of wood.

The .54" pitch chain is primarily intended for the use of cabinet makers. It will cut particularly fine mortises. The .62" pitch chain is stronger and more robust; it is designed to cut small holes to commercial limits. The .89" pitch chain is the heaviest type. It has a wide application for larger work of the kind usually handled by manufacturing doors, screens, window frames, sashes, etc.

The Renold gang mortise gear enables two or more holes to be made in one operation and insures uniformity in size and in distance between holes. The guide bar is slotted back and front: one slot for fixing to the machine and the other allows a standard guide bar to be fitted close up to the gang mortising bar or a suitable distance away from it. Repair parts and chain grinding machines are also available.

### CLAMP BROCHURE

A new brochure is available from the Adjustable Clamp Company, 418 N. Ashland Ave., Chicago 22, Ill. These new clamps are known as the Jorgensen hinged clamps. They are deep reach bar clamps, provided with a hinge plate on the foot end by means of which the clamps can be mounted onto any flat surface; the hinge action permits the clamps to be positioned either in clamping position or out-of-the-way but ready for instant use on the job.

Positive final screw pressure provides for ample take-up. The sliding head part of the clamp adjusts instantly, holds securely any place on the bar. Four designs are available, providing for a "reach" of from 2" to 5" and opening capacities of from 6" to 30".

### FASTENER HANDBOOK

A complete, fully-illustrated, 24-page handbook describing fastening specialties has just been issued by Southco Division, South Chester Corporation, 1400 Finance Bldg., Philadelphia 2, Pa.

A section is devoted to each of seven different fastener types: screw fasteners, blind rivets, adjustable pawl fasteners, door latches, spring-grip fasteners, anchor nuts and door retaining springs. Each section has photographs, drawings, tables of dimensions and size, and descriptions.

Each of the Southco fasteners described is designed to do a particular fastening job most efficiently.

### HEAVY DUTY BAND MILL

New illustrated catalog describing in detail the improved McDonough 72" heavy duty band mill has just been released by the McDonough Manufacturing Company of Eau Claire, Wisconsin. This new double column 6' band mill is designed for heavy duty sawing with a maximum capacity of a 60" diameter log.

## BROCHURE ON VENEER JOINTER

A brochure giving a complete explanation of operation plus catalog information and specifications on the company's traveling head veneer jointer is offered by Merritt Solem, Division of Solem Machine Company, 126 South Niagara St., Lockport, N.Y. Requests should be made for brochure No. J-53-10-6.

As outlined in the brochure, the traveling head veneer jointer is available in five sizes from 8' to 16'. A company spokesman points out that this jointer provides an infinite variable cutting speed up to 75 f.p.m. Other features of the jointer explained in the brochure are, adjustable gauge bar, precision "Vee" ways and two operating stations featuring push button controls.

## CARBIDE CATALOG

Huther Bros. Saw Mfg. Co., Inc., Rochester 7, New York announce the publication of a new tungsten carbide tipped saw and cutter catalog CT-100. In addition to picturing and describing their standard line of high quality carbide tipped circular saws, many new items are included, such as, No. 500 carbide tipped dado head, our new No. 142 carbide tipped saw grinder for sharpening carbide tipped saws, new design carbide tipped matcher cutters, cupboard door cutter sets and new No. 502 mitre joint cutter set and formed tooth special carbide tipped shaper cutters.

## SHAPESANDER

A new 4-page folder has been issued by Timesavers, Inc., P. O. Box Lr, Robbinsdale 22, Minn., describing the features of their Model 0-24 Shapesander. The sander is used for production sanding on all types of curved serpentine, tapered and straight wood stock. The folder describes the outstanding features of construction such as the oscillating drum, magic touch feed roll and instant reversing switch. It also contains photographic illustrations of the Shapesander in use for


HENDRICK PANEL SAW

Low Cost - Accurate Long Rail Panel Saw

Endorsed by leading Acrylic and Structural plastic manufacturers.

Hand wheel drum and cable device are now standard equipment with all Hendrick panel saws. Quickly adapted to all MLR equipment.

Cuts large sheets of plastic, plywood, and metal for all fabricating jobs. One operator activates saw across panel by handwheel, drum and cable control. Greatly improves accuracy and speed. Rigid rail mounts permit large sheets to be held in firm cutting position. Cut is carried downward, producing a clean finish. Saw can be tilted with rails 90° for rabbeting and mitering. Saves considerable handling — reduces all cutting costs — gives accurate cut on all large panels. Available in 6', 8', 10', and 12' long rails.

Many of these MLR panel saws are in use today.

*Write for illustrated circular. Room 24*

HENDRICK MFG. CORP.

Marblehead, Massachusetts

various type sanding operations and their rate of production.

A specification chart clearly gives the dimensions, capacities, speeds, motors and other pertinent data on all five models of Shapesander now being manufactured.

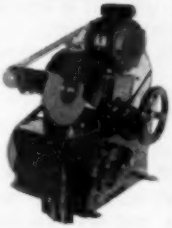
**ROUTER BOOKLET**

Stanley Electric Tools, New Britain, Connecticut has just published a new book on "The Router, What It Is and Does." Announeed as the first comprehensive handbook illustrating and describing the many uses of the portable (hand fed) electric router, it contains 100 photographs and line drawings showing the main applications and setups which are possible with this versatile tool.

Major parts of the router are identified, as well as its adaptability to an endless number of jobs; operating instructions include how to cut a dado, groove, mortise and tenon, rabbet, inlay, dovetail, moulding of all types, etc.


**NEW SIMPLEX**

**AUTOMATIC SAW SHARPENER**



Simple, yet accurate and efficient.
Precision grinding of hard edge metal and wood cutting band and circular saws and hack saws.
Vise takes band saw blades ¼" to 6" wide, circular saw blades, 4" to 18" in diameter, hack saw blades ¼" and up.
Motor driven, automatic feed.
Sealed ball bearings on main shafts and motor.

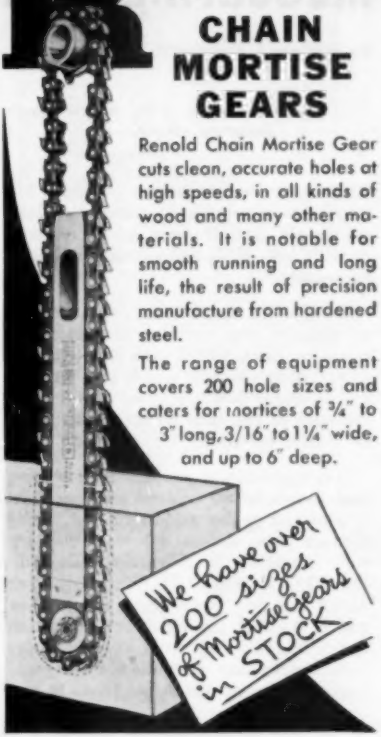
**Further Details Upon Request**

**ZEILLER & NAGEL, INC.**
**232 JAVA ST. BROOKLYN 22, N. Y.**



**RENOLD**

**CHAIN MORTISE GEARS**




Renold Chain Mortise Gear cuts clean, accurate holes at high speeds, in all kinds of wood and many other materials. It is notable for smooth running and long life, the result of precision manufacture from hardened steel.

The range of equipment covers 200 hole sizes and caters for mortices of ¾" to 3" long, 3/16" to 1¼" wide, and up to 6" deep.

Renold Gang Mortise Gear enables two or more holes to be cut in one operation, ensuring uniformity in size and in distance between holes.

**GENERAL CHAIN AND BELT CO.**
292 Lafayette St., New York, N.Y.

# Measuring Moisture Contents

By William J. Delmhorst

This article is the first of several we hope to present on this same important subject.

THE moisture detector is a precision instrument. It is made to extremely close tolerances and, if used properly, will provide you with exact moisture measurements.

Because so many tests can be made so quickly and because the tests are made on stock which goes into production, not on a sample which is discarded, the moisture detector gives an accurate measure of the true moisture condition of a load of wood.

It is important to remember, however, that the moisture content measurement is confined to the wood adjacent to the contact pins. Unless the wood is very well seasoned, it is rarely uniformly dry. This is especially true of lumber which has just come from the kiln or which is either drying in the kiln or in the drying yard. This variation in moisture distribution is caused by several factors, most of which originate in the wood itself. For example, end grain dries more rapidly than edge grain, and edge grain dries more rapidly than flat grain. Sapwood dries more rapidly than heartwood, and combined with these differing drying rates the moisture content of the wood, when it is green from the saw, has different amounts of moisture in various parts of the board. The stickers also slow down the drying rate so that the wet spots will be found where they crossed the board.

### Moisture Content and Shrinkage

Depending on the relative humidity of the air, all wood either picks up moisture from or loses moisture to the air to which it is exposed. For every given relative humidity there is a corresponding moisture content (equilibrium moisture content) for the wood to which it will equalize.

"Green" lumber, that is lumber from

SHRINKAGE OF SOUTHERN YELLOW PINE AND DOUGLAS FIR

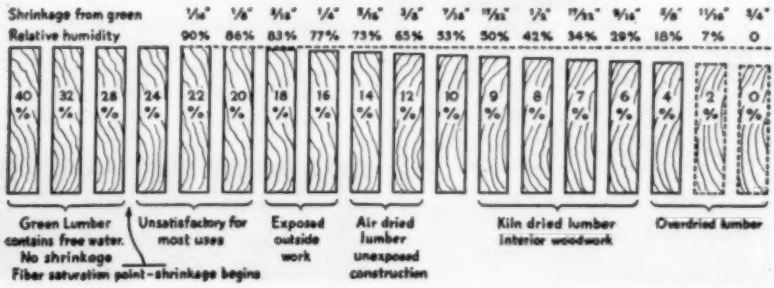

Shrinkage from green
1/16" 1/8" 3/16" 1/4" 5/16" 3/8" 7/16" 11/32" 1/2" 17/32" 9/16" 5/8" 11/16" 3/4"
Relative humidity
90% 86% 83% 77% 73% 65% 53% 50% 42% 34% 29% 18% 7% 0
40 % 32 % 28 % 24 % 22 % 20 % 18 % 16 % 14 % 12 % 10 % 9 % 8 % 7 % 6 % 4 % 2 % 0 %
Green Lumber contains free water. No shrinkage
Unsatisfactory for most uses
Fiber saturation point–shrinkage begins
Exposed outside work
Air dried lumber unexposed construction
Kiln dried lumber interior woodwork
Overdried lumber

**TABLE I**

| | MOIST. PERC. Min. | Max. | Usual |
|---|---|---|---|
| Automobile body stock | 5% | 10% | 6% |
| Baskets and fruit packages | 8 | 45 | 20 |
| Boxes and crates | 6 | 18 | 12 |
| Brush Handles and Backs | 2 | 10 | 5 |
| Car Decking | 8 | 16 | 12 |
| Inside Box Car Material | 7 | 12 | 9 |
| Caskets and coffins | 5 | 6 | 5½ |
| Rough boxes | 6 | 14 | 10 |
| Chairs and chair stock | 5 | 12 | 6 |
| *Cooperage: | | | |
| Tight staves and Heading | 5 | 7 | 6 |
| Slack staves and Heading | 6 | 12 | 7 |
| Flooring | 6 | 10 | 6 |
| Furniture Stock | 4 | 10 | 6 |
| Handles | 2 | 10 | 7 |
| Instruments, musical: | | | |
| Radios, Piano cases, Actions | 3 | 6 | 5 |
| Sash, doors, blinds, etc. | 4 | 8 | 6 |
| Ship and boat lumber | 12 | 15 | 12 |

* There is a wide difference of opinion regarding proper moisture content of tight cooperage stock. Many manufacturers claim oak staves should be dried to 12% and heading to 8% before being charred. Many slack barrel manufacturers dry potato and apple barrel staves to 15%.

| | MOIST. PERC. Min. | Max. | Usual |
|---|---|---|---|
| Shoe last Blocks | 4% | 6% | 5% |
| Shoe Heels | 3 | 9 | 6 |
| Shuttles and Bobbins | 4 | 6 | 5 |
| Spools | 4 | 12 | 8 |
| Tanks and Silos | 8 | 16 | 12 |
| Trunks and Valises | 4 | 9 | 6 |
| Wheel spokes | 2 | 5 | 4 |
| Veneers: | | | |
| Face | 2 | 7 | 4 |
| Crossband | 2 | 10 | 5 |
| Core | 4 | 6 | 5 |
| Plywood | 2 | 9 | 6 |
| Shingles | 10 | 12 | 10 |
| Lumber: | | | |
| Rough construction | 10 | 24 | 15 |
| Joists, studs, sub-flooring | 6 | 20** | 8 |
| Timbers, Crossties, Poles, etc. for treatment with creosote or other preservatives | From water should be removed and m. c. reduced to about 25% before treatment. | | |

**We consider 20% m. c. too high for sub-floors and framing; should be 15% or lower.

a newly fallen tree, will have a moisture content ranging from 35% to as high as 250%, depending on the species and where grown. At this time the moisture is in two forms: It is absorbed in the cell walls and as free water within the cell cavities. As wood dries, the free water leaves first, and only when all of the free water is evaporated do the cell walls begin to dry. The point at which the cell walls begin to dry is known as the fiber saturation point, usually between 25% and 30% moisture content. As shown in the illustration, no shrinkage takes place until wood is dried below the fiber saturation point; from this point the shrinkage is approximately proportional to the change in moisture content.

The illustration shows the relationship between average relative humidity of exposure, corresponding equilibrium moisture content and shrinkage for mixed grain Douglas fir or Southern yellow pine boards 12" wide. For flat or face grain add 25% to the figure; for vertical grain subtract 25%. The illustration shows how shrinkage can be predicted with a moisture meter. For example, if a 12" board with a moisture content of 12% and having undergone a shrinkage from green of ⅜" were used indoors where the average relative humidity was 35%, the wood would dry to 7%, and it would shrink another 5/32" to make a total shrinkage of 17/32". In the manufacture of most wood products, a small amount of swelling can be tolerated better than an equal amount of shrinkage, and it is common practice to kiln dry wood slightly below the equilibrium moisture content when in use.

Whenever it is necessary to measure moisture content, it is equally important to determine whether or not the stock is of uniform moisture content.

**TABLE II**

Showing the Moisture Meter Readings when Electrode Pins are driven 1/16 and 5/16 into Wood of Uniform Distribution of Moisture.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1/16 Penetration | 6.2 | 7.0 | 8.8 | 10.0 | 11.5 | 13.0 |
| 5/16 " | 7.0 | 8.0 | 10.0 | 12.0 | 14.0 | 16.0 |

Readings shown at 5/16 penetration are equal to those obtained when the moisture detector is used in the usual way.

**TABLE III**

Comparison of Moisture Meter Readings when Pins are Driven 1/16 and their full length of 5/16 into Wood with Various Distributions of Moisture, as shown in the Graphs in Figures 1 & 2.

| Distribution | 8/4 BIRCH | | | | | 4/4 FIR | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Curve | 7 | 12 | 19 | 26 | 42 | 23 | 30 | 52 | 100 | |
| Meter Reading 1/16 | 17 | 15 | 13 | 11 | 10 | 15 | 13 | 13 | 12 | |
| Meter Reading 5/16 | 27 | 24 | 20 | 16 | 13 | 24 | 22 | 19 | 16 | |
| Av. M.C. of Section | 45 | 32 | 23 | 19 | 14 | 24 | 22 | 19 | 16 | |

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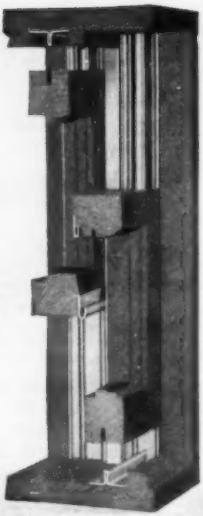

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Well seasoned stock has the same moisture content throughout. This means that the moisture content must be practically the same in all parts of the board, and there should be little difference between individual boards in the same load. The amount of variation that can be tolerated and the average moisture content of the lumber depends on what is to be manufactured from it (its ultimate use). For example, lumber used for packing boxes can have much greater variation of moisture than that used for the manufacture of furniture.

Table 1, compiled by Prof. Henderson of New York College of Forestry, shows recommended moisture content for various wood uses. This should only be used as a guide as the safe rule to follow is to manufacture the product at a moisture content which it will attain when in use. This, in turn, depends on the average relative humidity of the air to which the product is exposed when in service.

The moisture meter measures average moisture content in lumber up to 2" in thickness, unless there is considerable difference in the amount of moisture at the surface as compared with the center of the piece. (Steep moisture gradient.) When this condition exists, it is extremely important to detect it, because wood in this condition is not completely seasoned, and it is therefore unsuitable for most uses, even though it has the required average moisture content.

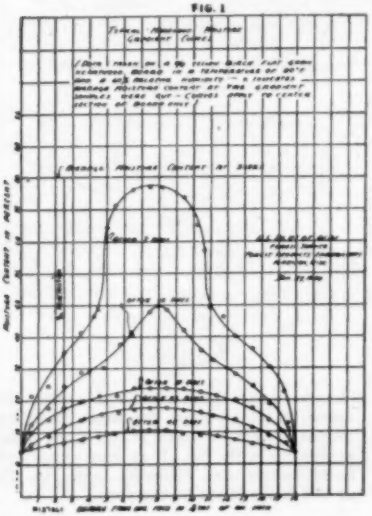


FIG. 1

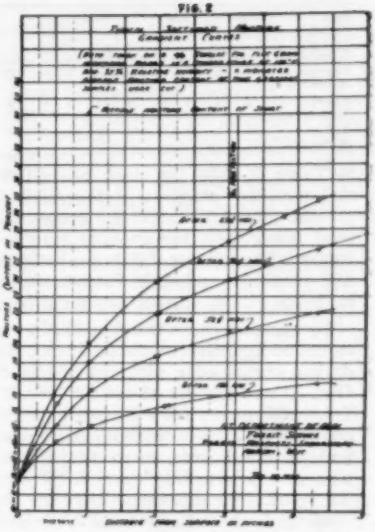


FIG. 2

To make absolutely accurate measurements at all times and to detect moisture gradient, make the tests as follows: Drive the pins 1/16" into the wood and read the meter. Then drive the pins into the wood to their full length and read the meter again. If the readings are in accordance with the readings in Table II, the meter is measuring average moisture content, and the stock is of uniform moisture content, i.e., is well seasoned. If the difference in readings is greater than shown

**KILN RECORD**

Date Pulled..... Kiln No..... Kiln Truck..... Date Checked.....

Thickness..... Species..... Grade.....

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Location | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| M. Reading | | | | | | | | | |
| Location | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| M. Reading | | | | | | | | | |
| Location | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| M. Reading | | | | | | | | | |

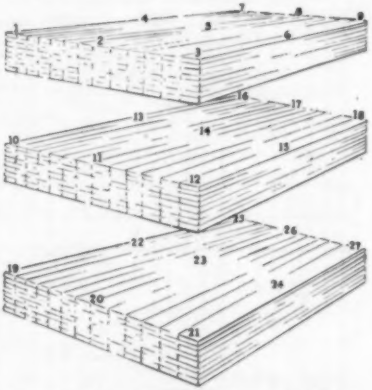
in Table II, then the stock has a normal moisture gradient. If the stock is greater than 1½" thick, the meter will read lower than the average moisture content. The greater difference between the readings and the figures shown in Table II, the steeper the gradient.

The graphs show the distribution of moisture at different times during the drying period of a piece of 8/4 birch (Fig. 1) and a piece of 4/4 fir (Fig. 2). Table III compares moisture meter readings and the average moisture content of the boards when the contact pins are driven 1/16" and 5/16" into the wood. The difference between the readings for both the 4/4 and 8/4 boards is greatest when the gradient is steepest and gradually becomes smaller as the lumber dries to a more uniform moisture content. The fact that the differences in the readings shown in Table III are in most cases greater than the differences in readings for wood of uniform distribution of moisture shows when the wood is not completely seasoned. Comparison of the readings made for 5/16 penetration (the usual method of using the moisture detector) and the average moisture content shows that all of the wood is below fiber saturation point; it shows, too, that the meter reads average moisture content on 4/4 stock, but reads lower than average moisture content on 8/4 stock. The combination of step gradient and thick stock produces the greatest difference in meter reading and average moisture content.

For an easy way to detect moisture gradient and to know whether the meter is reading average moisture content, or is reading higher or lower than average,

**Delmhorst moisture detector**

use the meter as follows: Read the meter when the pins are just pricked into the board (about 1/16") and again when driven to their full length (5/16"). If the final reading is between 5% and 8% (normal for kiln dried stock), the first reading should be about 1% less than the final reading. When the final reading is between 12% and 15% (normal for air-dried stock), the first reading should be 2% to 3% lower than the




**Sketch shows how readings should be made in all parts of the load. Readings should always be made in the same order beginning with No. 1 at the upper left hand corner and finishing with No. 27 at the lower right in the rear.**

final reading when the stock has a uniform distribution of moisture. The final meter reading is the average moisture content. If the difference in the readings is greater than shown above, the stock has a higher moisture content at the center than at the surface; if the stock is over 1½" thick, the reading is lower than the average moisture content. If the difference in the readings is less than shown above, the wood has a higher moisture content on the surface than in the center, as would be the case of dry wood exposed to rain or fog. Under such conditions, the meter reading is higher than the average moisture content.

**Effects of Static**

When making tests on dry lumber, especially during cold weather, static electricity induced by movements of the electrode cable or of the operator's body may cause the meter pointer to move erratically. If your meter is equipped with a coaxial electrode cable, that is, it has a center conductor and an outer braided shield, make sure that the center conductor is connected to the upper jack on the moisture meter panel. Moisture detectors with the 80 - MT coaxial cable connector automatically connect the electrode properly.

**When Making Moisture Tests Below 7 Per Cent**

Accurate measurements of moisture below 7 per cent can be made by proceeding as follows:

1. Make sure the meter pointer is adjusted so that it rests directly over "X" mark when the electrode is disconnected from the meter, and that the meter will again read "X" after the electrode is connected.
2. Drive the electrode into the wood.
3. Connect the electrode to the meter. Note that as the plug completes the circuit the pointer will move to the right, but will quickly settle to a constant reading, which is the moisture content of the wood. Refrain from making any movements such as touching the board or meter or moving the electrode cable while making the reading. If the meter pointer comes to rest 1/3 of the distance between "X" and 7, the moisture content is 6. If it returns to the "X" mark, the moisture content is 5 or less.
4. When the cable is again disconnected from the meter, the pointer should return to "X."

**Temperature of Wood and Its Effect On Moisture Meter Readings**

As the temperature of wood increases, its electrical conductivity increases and causes the meter to read higher than the actual moisture content when the temperature is over 70° F, and lower than the actual moisture content when the temperature is less than 70° F. When the wood temperature is within 20° of 70°, the corrections are so small that they can be neglected. When exact measurements are required or when the temperature is very high or low, be sure to apply the correction shown in the temperature correction table. Note that no corrections are shown for wood with a moisture content in excess of 25%, as the moisture meter in this range is subject to considerable variation. Moreover, when green wood is frozen, the difference between the actual moisture content and the meter reading may be 30% or more. Approximate readings in the green range of moisture content can only be made when the wood is between 50 and 90 degrees.

**Improving Kiln Operation**

The moisture detector should be used for separating green from partially air-dried stock so that the lumber going into the kiln is known to be either below or above the fiber saturation point. It should also be used at the end of the run to determine when the lumber is dry and to determine when the charge can be pulled.

One of the most important uses of the moisture meter is to determine whether or not dry kiln is doing the job it is supposed to do. Many kiln operators assume that the moisture content of the entire charge is equal to the moisture content of the sample board. This assumption is often far from the truth. Moisture readings should be made in all parts of every load of dried lumber as it is unstacked. Moisture meter reading should be made at three points across the front, middle and back, near the top, half way down and at the bottom of each load, and all readings should be made on **different** boards. The readings should always be recorded in the same sequence (as shown in the sample kiln record below) so that at any future time the location of a particular test can be determined from the record. Consistently high or low readings at any location indicates that the kiln is not working efficiently and that steps should be taken to correct the condition which causes poor circulation or uneven distribution of heat. Check steam traps, air circulation, direct radiation, and lumber stacking.

The moisture meter should not be used for measuring the moisture content of the green sample board, because the readings are likely to be inaccurate above the 30%. The moisture meter should be used for selecting the sample board, for it will show the relative amount of moisture. This makes it easy to select the board having the high moisture content. For determining the estimated dry weight of the sample board, the usual method of oven dried samples cut from the ends of the board gives the best results. The moisture meter is not recommended or used in measuring the moisture content of the sample board except when nearing the end of the run. As long as the sample board is of average moisture content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of 10% or more, due to the uneven drying, the moisture meter will give a wide range of readings. This is due to the fact that the moisture meter reading is very local in nature and usually equals or closely approximates the moisture content of the wettest fibers touching both sets of contact pins. While the board is in the process of drying, because of the difference in the original moisture content in different parts of the board, because of the difference in the drying rate of heart and sapwood, the difference of drying between quarter and flat sawn stock and the difference in grain structure, there is a wide variation in moisture content in different parts of the board until near the end of the drying period. The moisture meter will indicate these variations.

Check moisture content of incoming lumber either in railroad cars or trucks making sure to make tests in all parts of the load.


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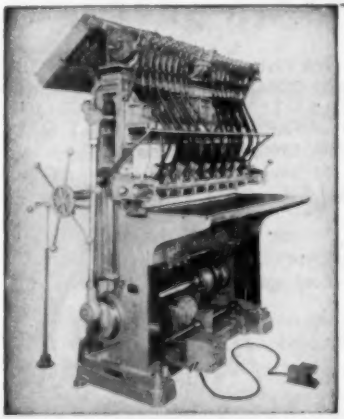

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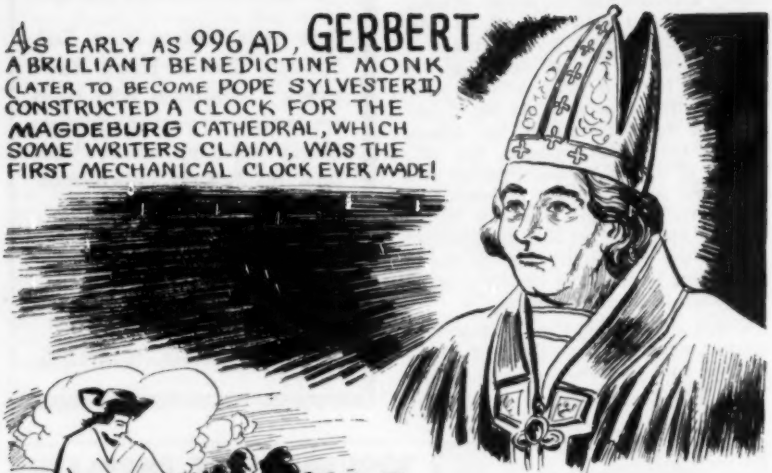

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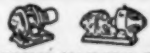

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## WANTED TO BUY

Used Salstrom Profiling Machine.

Used 36 inch wood band saw. Must be a good brand and in good condition.

**Robert Nicolin**
**WASECA, MINNESOTA**

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## MACHINERY WANTED

SINGLE MACHINES OR COMPLETE PLANTS—No machine too small or plant too large to interest us. Will pay spot cash. Advise what you have for sale.

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1961 EAST MILWAUKEE AVENUE
DETROIT, MICHIGAN
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**AN EXPERIENCED FOREMAN**

Must be qualified to take complete charge of operations and become part of management.
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# New AND Rebuilt TO NEW STANDARDS

## NEW MACHINES

**Band Saws**
Belt & M.D.
20", 30", 32", 36"

**Jointers**
8", 12", 16", 20", 24" M.D.

**Borers**
Single Spindle, Vert. & Hor.
Mult. Vert., 4 or more Spindles, boring area 24"x30"
Mult. Vert., 4 Spindle, 40"x12" area

**Saws**
Tilting arbor, M.D.
Tilting table, M.D.
Self Feed Rip, M.D.
Radial Arm

**Planers, Single**
12", 16", 20", 24", 30" M.D.

**Sanders**
Hand Block Belt, M.D.
Edge Belt, E.C. No. 111, M.D.
Miscellaneous large stock of belt and motor driven machines

## REBUILT MACHINES

**Jointers**
8", 12", 16", 20", 24"

**Mortisers**
Hollow Chisel, Vert. light & heavy duty
Hollow Chisel, Hor. light & heavy duty

**Moulders**
Greenlee 8"
Hermance 10" & 12" 4 sides
S. A. Woods 8"
XL (New) 4" & 6"

**Sanders**
Smith 42" 3-drum D.M.D.
American 30", 42" 3-drum roll feed, D.M.D.
F & E 24" 2-drum roll feed

**Surfacers**
Single and double
26", 30", 42"

**Shapers**
Single & Double Spindle M.D.

**Saws, Variety**
Tilting arbor
Tilting table
Double End Cut-off
Radial Arm, cuts off 48" wide
Radial Arm, 2, 3, 5 h.p.

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**Totally enclosed, dust proof, fan cooled, ball bearing motors, 3600 R.P.M. From 1 h.p. to 15 h.p. Measures only 3¼" from center of motor shaft to flatted top, facilitating the use of the smallest possible diameter saw blade. 1-2-3-5 horse power motors in stock.**

**We also carry a large stock of Standard Frame 3 phase motors and controls.**

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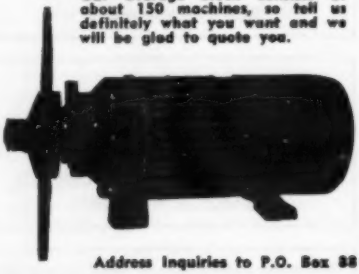

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**COLUMBUS 16, OHIO**

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### BORERS
Greenlee No. 236 Mul. Spindle Borer, 7½ H.P.
Greenlee No. 356 Single Spindle Vertical Boring Machine, 2 H.P.

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Fisher No. 41 Hand Hole Grooving & Equalizing Machine, 10½" to 24"
Mereen-Johnson Box Board Squeezer, Belt Drive

### GLUE SPREADERS
Black Bros. 6" Double Glue Spreader
Union Model 31, 72" BB Dbl. Resin Glue Spreader

### JOINTERS
Mattison-Greenlee No. D-618 Lumber Jointer
American 12" Jointer, B.B.
Oliver No. 122 Automatic Feed Facing Planer
Porter 30" Facing Planer, 15 H.P.
H. B. Smith 16" Hand Jointer, belt drive
Oliver Straight-O-Plane No. 170, 36" B.B., D.M.D.

### LATHES
Mattison, 53C, 20" Auto. Turning Lathe, B.B.

### MORTISERS
Onsrud No. 311 Single Hor. Oscillating Bit, B.B.
4—Whitney Mortiser, Model No. 67, D.M.D., B.B.
Greenlee Hollow Chisel, Model No. 228, Ser. 27622

### MOULDERS
Vonnegut 12", Electric B.B., 10, 10, 5 & 7½ H.P. Motors
Vonnegut 12", All Electric, B.B., Ser. No. 12280, 15, 15, 10, 10 & 5 H.P.

### PLANERS, MATCHERS & SURFACERS
Solem PB-2 25" Single Planer, B.B.
Powermatic No. 2-A 20" B.B., Single Planer
Whitney No. P-19, 30"x7" Heavy Duty Double Planer, B.B., D.M.D.
Whitney Double Surfacer, 30", belt dr., less mtrs.
Whitney No. 24, 30"x7" 8-roll, Double Cabinet Planer, B.B.

### ROUTERS
Heavy Duty Radial Arm Router, Onsrud, H.B.
Ekstrom, Carlson No. 244 Electric Router, with 2 H.P. Motor
Onsrud Radial Arm Router, W-147-E, with 12' arm
New Onsrud Type W-147-E Rad. Arm Router, B.B.

### SANDERS
2—Mattison No. 124 Automatic Stroke Sanders, 6'
Wysong & Miles Hydrastroke, 8', No. 603 Hydraulic Stroke Sander, B.B.
Curtis (Hand Block) Belt Sander, B.B.
Berlin No. 431 Endless Bed Three Drum Sander, 42" spiral rolls
Solem Model S3M 49" 3-Drum Endless Bed Sander
3—Used Nash No. 53 Dowel Rod Sanders, D.M.D.
4—Porter Cable Spd. Oscillating Sanders, D.M.D., B.B.
No. 2 Pneumatic Sander on Gardner Base

### BAND SAWS
Crescent 36" Band Saw, tilt table, V-belt drive
Jones Superior 36" Band Saw, Belt drive

### CUT-OFF SAWS
Jenkins No. 105 Double End Cut-Off Saw—60"x18"
Porter 43-20S Slasher and tables

### JIG SAWS
Oliver 173-E Jig Saw

### RESAWS
Fay & Egan No. 648, 42" Vertical Band Resaw

### VARIETY SAWS
American Monarch Unipoint Radial Arm Saw, 3 H.P., D.M.D.
DeWalt Radial Arm Saw, 5 H.P.
Tannewitz Tilting Table Type Variety Saw

### SHAPERS
Defiance Doible Spindle Shaper, Model 720, with 30" centers, D.M.D.
Onsrud W-125 Automatic Shaper with forms
Onsrud W-206, Single Spindle Shaper, with 5 H.P. Motor
2—Whitney Shapers, Model No. 386, with 30" ctrs.
Yates-American Single Spindle Shaper, No. N-4

### TENONERS
2—Greenlee Single End Tenoners, Model No. 535
Greenlee Single End Tenoner, Model No. 534
Harris Single End Bench Tenoner, No. BT-112

### MISCELLANEOUS
Nash Double End Cut-Off & Chucking Machine
Whitney No. 67 Hor. Oscillating Bit Mortiser converted to Chucking Machine
Chucking Machine for Mop Handles
Nash No. 5 Dbl. End Saw & Bore or Chuck Mach.
Air Compressor, Ser. 77137 DeVilbiss, Type UAG 3101
Fox No. 2 Mitre Cutter
Doddz Dovetailer, 10 Spindle
Jenkins Type "R" Dowel Rod Machine, B.B., 15 H.P. Motor
7½ KW Frequency Changer, with driving motor
Stedman Type BX, 20-12 Nife-Less Hog
Mitts & Merrill Type A Knife Hog, Ser. E5953
Mitts & Merrill A-12, Hog
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Mattison Lathe Knife Carriers, 245
8—Mattison Lathe T-Slot Segments
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New 25 H.P. Sterling Motor, 3600 R.P.M.
Woods No. 301 Automatic Production Motor Driven Post Groover
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Stempelkamp High Pressure Pump for Mod. FPb-10
Rogers Hydraulic Hot Plate Press, with 10 H.P. Pump System
Reynolds Automatic Screw Driver
Steam Generator & Tank
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2—Woodwelders, FC-2000
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Hand Jointers 6" to 16" — Mitre Saws — 24" Single Planers
Self Feed Rip Saws — Radial Arm Saws — 36" Band Saws
Complete Line Delta Machines — Kindt-Collins Sanding Equipment

**"HACKETT REBUILT"—QUALITY MACHINERY**

**BAND SAWS**
Crescent 32", Ball Bearing, D.M.D.
Crescent 36", V-Belt, Motor-drive
Tannewitz 42", V-belt, Motor-drive
West Side 36", V-belt, Motor-drive
American 36" Ball Bearing V-belt, M.D.
Chicago 27", V-belt, Motor-drive

**BAND, RIP AND RESAW**
Yates No. 312 44" chain-feed, hand rip
McDonough 62", vertical band resaw
Mershon 42" Twin Band Rip, BB

**BORING MACHINES**
Greenlee 8-ft. No. 386 Universal Spindle M.D.
Rogers single spindle, horizontal
McKnight No. 26-F, double end, M.D.

**BLOWERS AND FANS**
American size 40 Type E "TWIN" & motor
American No. 00-E with 40 HP coupled motor
Clarage type C-1 suction fan, ½ HP motor

**CLAMPS - GLUEROOM EQUIPMENT**
Handy No. 71 Revolving Case Clamp
Bell No. 11 power door clamp, squaring attach.
Greenlee No. 599 frame and furniture clamp
Taylor 6' 12-section wheel type clamp carrier

**FILING ROOM MACHINERY**
Hanchett 70" style DN Knife Grinder, M.D.
Covel Hanchett GK 42" Knife Grinder, M.D.
Hanchett No. 808 lap gr. BB max. cap. 8" wide
Wardwell Y-18 Circular Saw Filer, M.D.

**JOINTERS**
Diehl No. 66, continuous feed, direct M.D.
American No. 1, 18" Ball Bearing, D.M.D.
Yates No. 199, 20" round head V-belt M.D.
Porter No. 300 CM, 12", D.M.D., B.B.
Porter Style C 12" Round Head, M.D.
Moyers continuous feed, V-belt, M.D.

**LATHES**
Oliver 12"x8' Bed, Hand Carriage
Imperial automatic shaping lathe, B.B., M.D.
Porter 16"x10' bed with motor

**MORTISERS**
Sidney No. 707 Chain automatic feed, M.D.
Sidney 705 Hollow Chisel Automatic feed, M.D
Whitney No. 67 Oscillating Belt M.D.
New Britain No. 2 Chain, with motor

**MOULDERS**
Yates-American C-88, 12" All Electric
Mattison No. 229, 10 in., All Electric
Newman 4x4", All Electric
Yates No. 106, 10" belt drive coupled motor
Woods No. 132-M 6" Electric
Yates No. C-3 4" fast-feed with motor

**NAILING MACHINE**
Auto Nailer "Blue Model," M.D.

**PLANERS**
Whitney No. 32 24" single, ball bearing, M.D.
Buss No. 4-L, 24" Single, Ball Bearing
Newman No. 600, 24" Single D.M.D.
Yates B-2 36" Double, M.D.
Yates No. 158 20" round head M.D.
Yates No. 177 30"x12" Double, M.D.
American No. 88 15" Double, Heavy Duty

**ROUTERS**
Onsrud W-240 Ball Bearing, Vert., M.D.
Carter Type TR., M.D. 15000 r.p.m.
Ekstrom-Carlson No. 126, BB., M.D.

**SHAPERS**
Whitney No. 134 double spindle, D.M.C.
Porter No. 103 single, ball bearing, M.D.
Whitney No. 165 S.S. motor on arbor
Onsrud No. W-248 single spindle, high speed
Whitney No. 282 single D.M.D. 58"x40" table
Greenlee No. 180, double spindle D.M.D.

**SANDERS**
Yates-Am., S-33, 91" 3 dr. End, Bed Sand., MD
Yates No. 421 6-drum with motors
Fay & Egan 30" 2-drum end. bed, M.D.
Mattison No. 124, 6' automatic stroke, M.D.
Oliver No. 182, 19", disc M.D.

**MITRE SAWS**
Delta 10" Tilt table with motor
Monk 16A Tilt table D.M.D.
Whitney No. 61, tilting arbor, D.M.D. B.B.

**CUT-OFF SAWS:**
Multiplex Model 30-A, 5 HP motor
Oliver No. 94-D Straight Line, motor on arbor
American No. 51 swing saw, M.D.
Multiplex No. B-60 radial arm, 7½ HP motor

**RIP SAWS**
American self-feed with motor
Greenlee No. 429 Roll Feed with motor

**TENONERS**
Greenlee No. 834, tilting spindle D.M.D.
American single-end with copes, rolling table

**This is only a partial list—send or call your inquiries**

**1965 E. MILWAUKEE — DETROIT 11, MICHIGAN**

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## BORING MACHINES

Andrews 6 sp. vert. air feed
Andrews 6 sp. horiz. belt drive
Greenlee Single MD Vertical
Root single MD vertical
Root single vertical, MD, Motor Feed
Towsley 2 spindle, 2" to 16" with foot treadle

## DOVETAILERS

Dodds 10, 15, 20 spindle

## DOWEL MACHINES

Hawker No. 2 All Ball bearing & roller bearing VBD

## JOINTERS

American 12" Wedge Bed BB
American 16" Wedge Bed BB
Crescent 12" DMD
12" Colloday L. Powers, H. B. Smith, Crescent, Sidney
Moak 16" M.D., B.B.
Northfield 12" DMD
Yates-American 16" D.M.D.

## LATHES

Mattison 55C BB Live Tailstock

## MORTISERS

Greenlee No. 228, Belt Drive
New Britain No. 2 and 7
Northfield chisel mortiser, motor driven
Wallace chisel mortiser, motor driven

## MOULDERS

Mattison No. 224 9" all electric, hopper fd.
Mattison No. 262 6" Drop Bed, BB, all elec.
Yates C4A 8 x 4 B.D.
Yates C55 9" DMD All Electric
Yates-American, 18" DMD C55, BB

## PLANERS

Northfield 24" single, MD motor fd. No. 5
Whitney No. 32 36" BB CMD Knife Grinder
Whitney No. 32, 30" BB, Belt Drive
Whitney No. 29 40" CMD, BB
Whitney No. 24, 30" Double—CMD

## PLANER & MATCHER

Fay & Egan No. 156 20"x8" 6 hds., belt dr.

## ROUTERS

Ekstrom-Carlson 126
Onsrud Air

## SANDERS

Peerless 9", 14" and 20" horizontal
Oakley Model D Semi-auto.
Peerless 9", 14" Vertical
H. B. Smith 3 drum 4 motors No. 404 BB
Vonnegut vertical drum sander
Wysong & Miles, Oakley, Mattison belt
Yates-American No. 431, 49", 3 drum

## SAWS - CUT OFF

Porter C43 5 HP DMD BB
Heston & Anderson No. 5, No. 25 & No. 55
Multiplex 5 HP DMD BB
Wallace 2 HP DMD BB
DeWalt 1 to 5 HP DMD BB

## SAWS - BANDSAWS

36" American, Tannewitz, Crescent, Oliver
36" DMD BB guarded Towsley
36" Fully guarded, BB, Pryibil
30" VB Drive Crescent
27" Crescent Band Saw
32" Crescent guarded BB VBD
Northfield BB & DMD 20" to 36"

## SAWS - RIP SAWS

Tidey 48" carriage
Tidey 30" carriage & boring attachment
Diehl BB No. 77 DMD HP
Hermance Straight Line Plain Bear., BD

## SAWS - VARIETY

American No. 10 tilt top belt drive
BM Root tilt top belt drive
Northfield tilt crbor, DMD, 5 HP
Northfield Tilt Top DMD
Fay & Egan DMD Tilt Arbor 5 HP
Pryibil No. 10 tilt top, BB, all Alum. gages
50 other makes to choose from

## SHAPERS

Advance Single spindle, clutch-driver, BB
American (S30) Single, spindle, 5 HP & 3 HP
Oliver No. 287 large top 7½ HP
Porter No. 206 2 spdl., BB, BD-mtr. mounted
Porter No. 206 2 spdl., 16" overhang bearing, BB, BD
Whitney BD No. 89 single, large top

## TENONERS

Newman single end BD

## VENEER MACHINERY

St. Joe MD, 66" Trimmer
Wilkins Challoner MD Door Clamp
44x12 sections
54x12 sections
60x24 Handy

## MISCELLANEOUS

Mershon 54" Band Resaw, MD, 40 HP motor, tilting rolls
Bellair Clamp
Electric Carpenter 5 mach. comb, BB, MD

**Endless canvas belts, large variety of lengths and widths, also sand belts for Skilsaw, Porter Cable and Vonnegut brush sanders. Accessories and supplies, tremendous lot both new and used. Also band and resaw blades.**

**WE PAY CASH FOR ENTIRE PLANTS OR INDIVIDUAL MACHINES**

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## GUARANTEED USED MACHINERY

Clamp Door, Power, Hayes with motor
Black Bros. 30 section 7' 0" Ball Bearing Clamp Carrier 4—37"x2½" jaw clamps per section
Veneer Press, Francis, 42"x108" Hydraulic with pump and motor
Retaining clamps with I-Beams
Band Saw, 30" American Ball Bearing
Sander Arm, Hermance, belt drive
Band Saw, 20" Monarch B.B., motor drive
DeWalt Radial Saw, 5 H.P. Victory model
Sash Relisher and Mortiser, American
Shaper, Y-A Single Spindle J-50-M.D.
Knife Grinder, Rogers 32" Cup Wheel
Saw Gummer, Rogers Circular Saw
Moulder, Yates-American No. C-88-8" Electric
Moulder, 15" Inside Berlin belt drive

### ALSO FOLLOWING FROM OUR STOCK

Morgan Camera Lock Corner Cutter 3/32" cutter
Vonnegut 6" Moulder, 48" hopper feed
Planers, New Powermatic 12x4 and 16x6"
Crescent No. P-24-24 x 8" Sgl. Planer, D.M.D.
Planer, New Delta 13x5 and 8-0 12x4"
Jointer, 30" American with power feed attachment
Mortiser, New Britain No. 3
Moulder 9" Rawley & Hermance belt drive
Resaw, Band Mershon w/motor, New Standard 54"
Surfacer, Double Berlin, 30"x8" with motors
Jointer, 16" Famous B.B. Motor Drive
Jointers, 12" Crescent, 10" Famous with motor
Band Saw Oliver, 36" belt drive
Radial Saws, DeWalt, 12 HP motor, 20" saw
Radial Saws, New Delta C-40 and C50
Shaper, Double Whitney with frequency changer
Variety Saw, Fay & Egan No. 500, DMD, 5 HP
Tenoners, Single End American No. 1 and No. 2½ with capes
Variety Saw, Oliver Double Arbor, M.D.
Yates-American No. T-50—30" automatic Lathes with 175 inches of heads, holders and knives
Tenoners, Double End Wilkins-Challoner with capes
Sander 48"—3 drum Roll Feed Fay & Egan No. 225, 3 motors, V-belt drive
Sanders, Hand Block Mattison and Fay & Egan
Woodworker Universal Crescent 32" Boice Saw, 8" Jointer, plain saw with 7½ H.P. motor
Sander, 3-Drum F&E No. 225—48" Roll Feed
Sander, 3-Drum Yates No. 431—48" Endless Bed
Sash Sticker Single Top Head only belt drive

*Send us your inquiry for machines not listed.*

## McDONALD MACHINERY CO.

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Tannewitz 42" BB MD
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Bell No. 205—4 Head
Greenlee No. 366 BB MD
Greenlee No. 368 Horizontal BB
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Root "GM" Single Spindle
Root "GMC" 6-Spindle BB MD
**CLAMPS**
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Black Pneumatic Case (NEW)
Handy Revolving Case
**DOWEL**
Wilkin-Challoner Pointer
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Bertholson 88x44 Hot Plate Press
Black Electric Cold Press
Jenkins No. 126—3 in 1 machine
Francis 75 Gallon Mixer
Francis 58" Spreader
Gillespie Electronic Core Press
**LATHES**
Mattison 55-C BB MD
Smith Novelty
**MORTISERS**
Greenlee No. 227 BB MD
Greenlee No. 228 BD
**RESAWS**
Mershin 54" PB BD
Fay & Egan 42" Rip and Resaw
**SAWS**
Bell No. 12 Double Mitre
Hermance No. 36 Chain Rip BD
**SHAPERS**
Whitney No. 395 Double Automatic
Whitney Double BB MD
Buss Double BB MD
**SANDERS**
Yates-American No. 433 BB MD
Smith 43" BB MD
American No. 9—61" MD
Pierson Model A Moulding
Mattison No. 137 Block
Lancaster 600-B Drawer
Mattison No. 124-6' Stroke
Peerless 14" Horizontal BD
Curtis Semi-Automatic
Crescent Double Spindle MD
**MISCELLANEOUS**
Mattison Hopper Feed (NEW)
Mitts & Merrill Hog 75 HP
Yates M-7 Head Grinder
Kiln Trucks
Dodds 12-Spindle Dovetailer
Merritt 54x84 Redrier
**TENONERS**
Wilkin-Challoner 96x72 MD
American No. 1 Single
Hayes Single

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## MODERN MACHINERY—BARGAIN PRICES!

**Diehl No. 660 Direct Motor Driven Ball** Bearing Continuous Feed Glue Jointer
**Root "GMC" Motor Driven Vertical Gang** Borer, six universal spindles
**Root "GM" Motor Driven Vertical Single** Spindle Borer
**Greenlee No. 228 Motor Driven Vertical** Automatic Hollow Chisel Mortiser
**Fay & Egan 16" Direct Motor Driven Ball** Bearing Jointer
**Solem S-3-M 49" Direct Motor Driven Ball** Bearing Three Drum Endless Bed Sander
**Fay & Egan No. 209—6" Ball Bearing** Moulder, coupled motor dr.
**Vonnegut 6" Electric Four Head Moulder,** hopper feed, round heads, jointers
**Onsrud W-240 High Speed Electric Router**
**Yates-American U-9 High Speed Electric** Router
**Yates-American U90 H. S. Electric Router**
**Mershon "New Standard" 54" Band ReSaw,** coupled motor dr.
**Fay & Egan No. 311—48" Ball Bearing** Angling Band Ship Saw
**Diehl No. 55 Motor Driven Chain Feed Rip**saw (95% new)
**Oliver 36" Direct Motor Driven Ball Bearing** Band Saw
**Belsaw Motor Driven Ball Bearing Gang** Ripsaw
**Tannewitz 42" D.M.D., B.B. Band Saw**
**Porter C43 Motor Driven Straight Line Cut** Off Saw
**New Britain No. 2 Chain Saw Mortiser,** vee belt motor driven
**Yates-American S-23 49" Direct Motor** Driven B.B. 3-Drum Roll Feed Sander
**Wilkin-Challoner Ball Bearing 3-Side Sash** Sticker
**Greenlee No. 165 Motor Driven High Speed** Single Spindle Shaper
**Whitney No. 134 Motor Driven Ball Bearing** Double Spindle Shaper
**Whitney No. 295 Direct Motor Driven** Double Spindle Automatic Shaper
**Buss No. 208—20" Motor Driven Ball Bear**ing Single Surfacer, sec. rolls, sec. chip., electric grinder
**Crescent P18 — 18" Direct Motor Driven** Ball Bearing Surfacer
**Whitney No. 24—30" Motor Driven Ball** Bearing Double Head Surfacer
**Whitney No. 29 - 36" Motor Driven Ball** Bearing Single Surfacer
**Buss No. 4—36" Ball Bearing Double Sur**facer, vee belted M.D.

**GUSTAFSON & SCOTT MFG. CO.**

**1637 N. LOWELL AVENUE** **CHICAGO 39, ILLINOIS**

## REBUILT AND USED MACHINES

**BAND SAWS**
Tannewitz G 30", Motor Driven
Colladay 30" & 38", Motor Driven
**BORERS**
Root G300 Heavy Duty Hyd. Vertical Single
Root D210 Hyd. Horizontal Single, H.D.
Greenlee No. 300 3 Ft. Vertical Multiple Spindle
**CARVERS**
Porter Ball Bearing, Single Spindle
Gallmeyer & Livingston Single Spindle
Minnesota No. 308E 16-Spindle Multiple
**CLAMP CARRIERS**
Taylor 7½' 40 Section Chain Type
**CLAMPS**
Handy No. 15 Portable End Clamp
Handy No. 444 Two-Way Air Clamp
**GLUING MACHINES**
Francis No. 3, 12" Hand Feed
Francis No. 280, 48" Edge Plate Gluer
Black 5-Gallon Portable Resin Mixer
**JOINTERS**
6", 8", 12", 16" & 20" Hand Jointers
Diehl No. 80 Continuous Feed Glue Jointer
Porter CM 16" Hand Jointer, D.M.D.
Porter 20" with 4-Post Feeder, M.D.
**LATHES**
Imperial Automatic Turning, D.M.D.
Mattison No. 55C Ball Bearing Auto. Turning
Porter 20" Ball Bearing Hand Lathe
**MORTISERS**
Wysong & Miles No. 283 F.F. Hollow Chisel
Wysong & Miles No. 284 P.F. Hollow Chisel
Fay & Egan No. 462 P. F. Hollow Chisel
American No. 20 P.F. Hollow Chisel
New Britain No. 2 Chain Saw Mortiser, M.D.
Enterprise Ball Brg. Pulley Mortiser, M.D.
**MOULDERS & STICKERS**
Hermance No. 50, 10" 4-Side, B.B.
Yates No. 108, 12" 4-Side, M.D.
Hermance B.B. 5" Top Head Sticker
Hermance B.B. 5" 2-Side Sash Sticker
**PLANERS**
Colladay & Power 24" Single, M.D.
Whitney and Buss 30" Single, M.D.
**SANDERS**
Smith No. 401, 42" 3-Drum Endless Bed
Fay & Egan 48" 3-Drum Endless Bed
Mattison No. 137, DMD Hand Block Belt
**SAWS—CUT-OFF—SAW TABLES**
Porter Floor Type, with Table
Porter No. 43-20J Hyd. Saw, M.D.
DeWalt Cut-Off Saws, 3 & 5 H.P.
Y-A No. 8, Tilt Arbor, Roller Table, M.D.
Hermance No. 2M Comb. Saw, B.B., D.M.D.
**SAWS—CHAIN FEED & SELF FEED**
Hermance No. 333 Chain Feed Rip
Yates G-2 B.B. Chain Feed Rip
Hermance 300-G Self-Feed, B.B., M.D.
**SHAPERS**
Porter No. 105 Single, M.D.
Porter No. 200 SVN Single, M.D.
Whitney No. 165 D.M.D., Single
Porter No. 155 Serpentine Shaper
Onsrud W-123 Automatic with Frequency Set
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Whitney 24"x7" Sec. R. & C. B. P.B.
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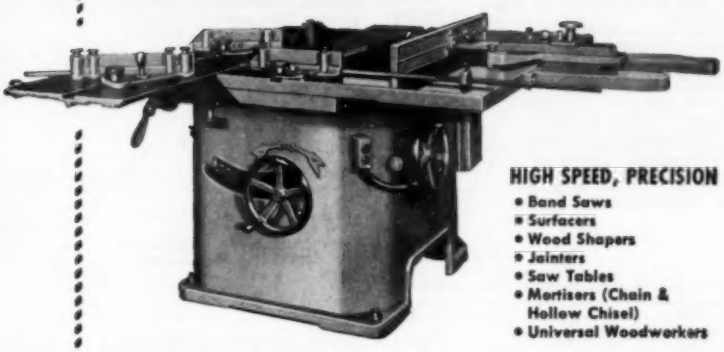

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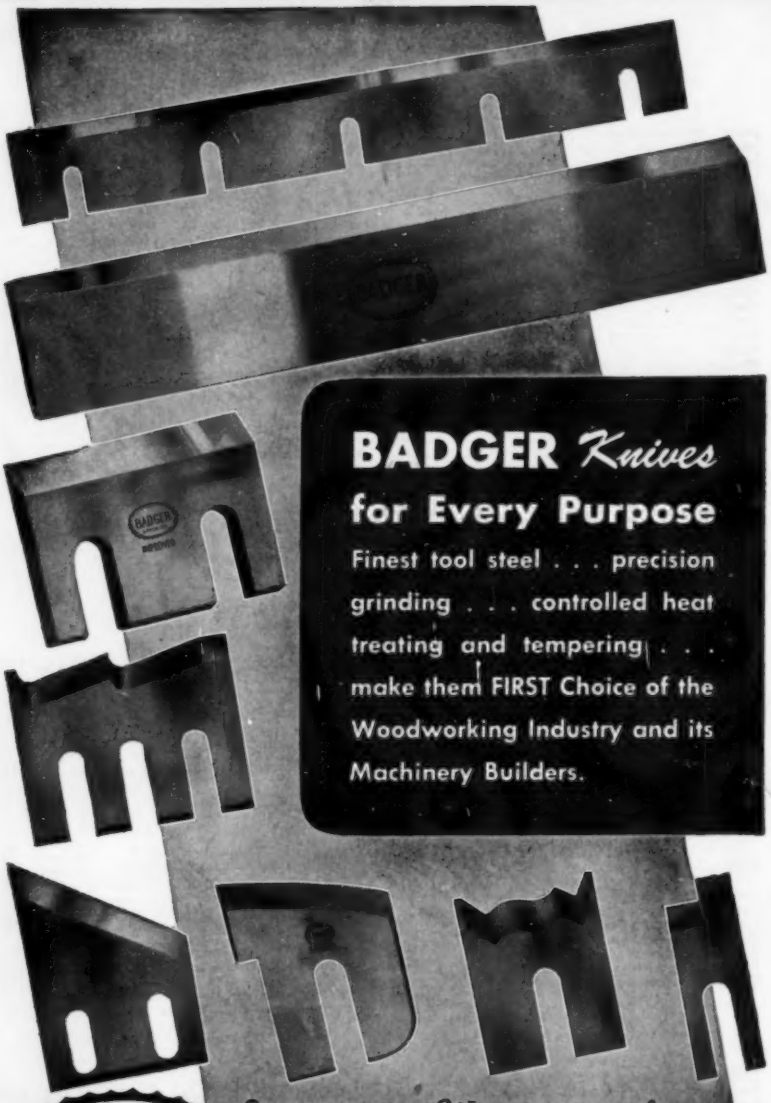


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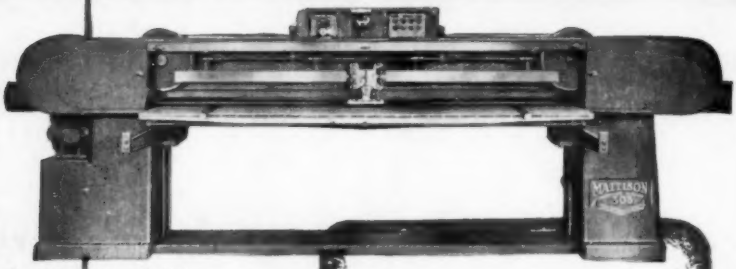
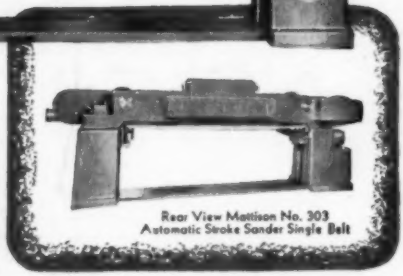



Front View Mattison No. 303
Automatic Stroke Sander — Single Belt

Mattison No. 303
Automatic Stroke Sander — Double Belt



Rear View Mattison No. 303
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